

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

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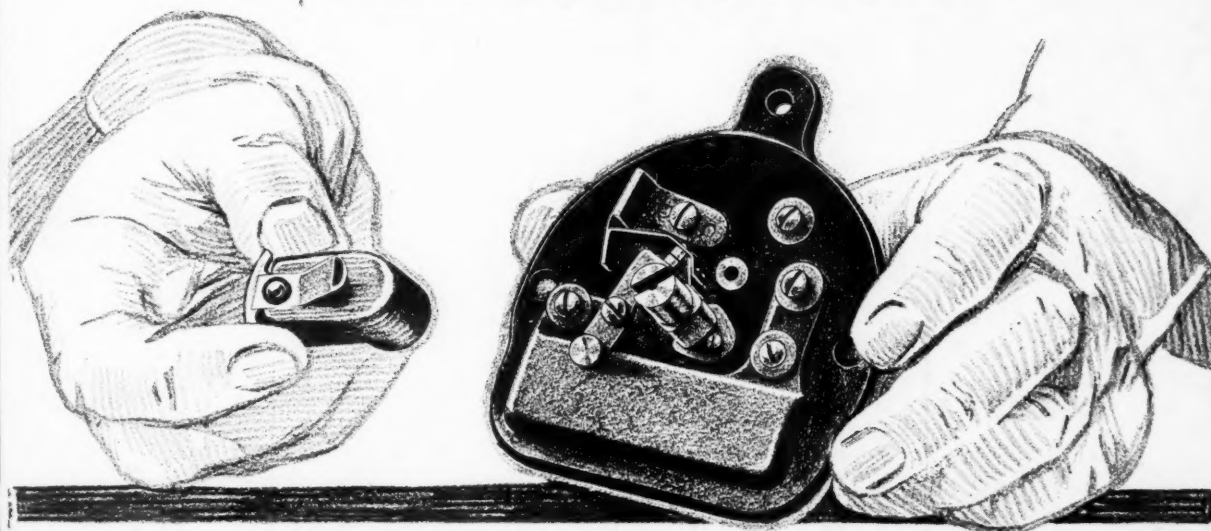
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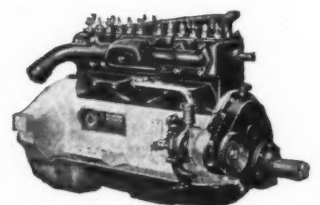
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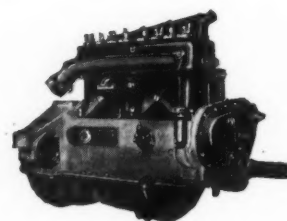
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# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XL

NEW YORK—THURSDAY, JANUARY 9, 1919—CHICAGO

No. 2

## First Description of the Ford "Baby" Tank

A Two-Man Fighting Machine Having a Duplicate Ford Automobile Power Plant—Radiator Mounted at Rear in Most Protected Position—Worm Drive—Armor Plate Body Forms Chassis Frame

**D**URING the closing period of the war the U. S. Army Ordnance Department prepared plans for manufacturing by thousands a small tank officially known as the 3-ton special tractor. Popularly, these tanks were known as Ford tanks, because they were equipped with many standard Ford parts, and, in fact, were built around the Ford powerplant in such a way that the tremendous capacity of this factory could have been used to turn out hundreds of these special 3-ton tractors, or little two-man tanks, per day. It is difficult to imagine how far this program would eventually have been carried. These tanks might have largely taken the place of infantry to form the first two or three waves of an attacking force.

The 3-ton special tractor is an armored, two-man type, equipped with one Browning tank machine gun, U. S. caliber 30, Model 1918, mounted on the left side of the tractor, and operated through a ball mounting in the armor cover of the front of the tractor. The tractor is driven by two 4-cylinder Model T Ford engines, placed parallel to each other. Each of these engines drives one track, but there is an idler gear interposed between the two engines, meshing with a toothed ring on each fly-wheel, which synchronizes the powerplants and virtually makes the two a single unit. From the engines the power is transmitted through two standard Ford planetary transmissions with disk clutches, two worm gears, axle shafts and drive sprockets to the creeper track.

### Powerplant in Rear

The powerplant is located in the rear, and the operator and gunner are in the forward end of the tractor, the gunner's position being at the left of the driver. The entire tractor is enclosed in armor plate, which varies

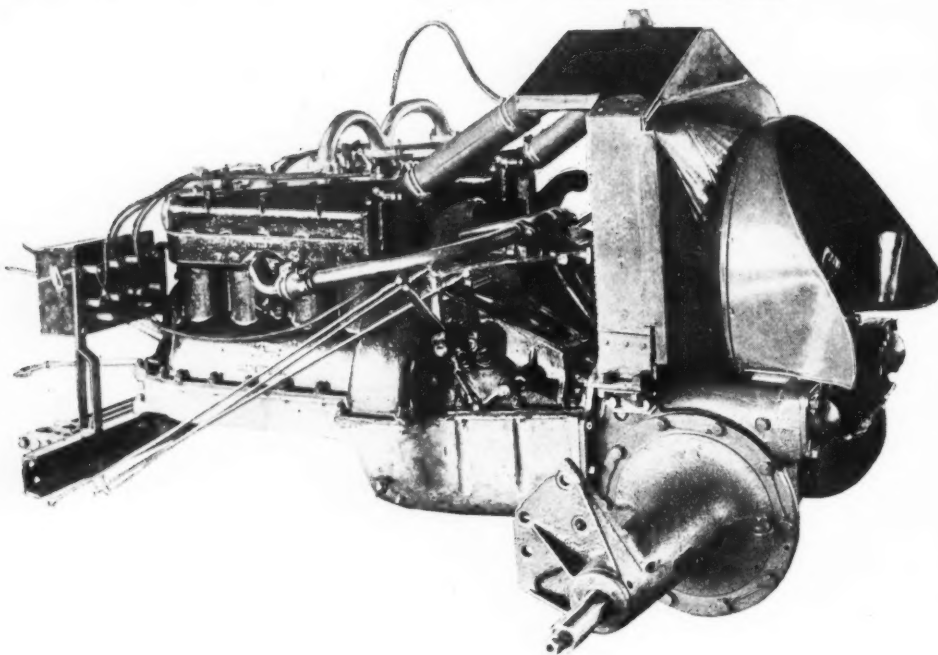
in thickness from  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, this being sufficient to withstand machine gun and rifle fire.

Each engine delivers its power through a conventional multiple disk clutch, in a unit with and directly behind the planetary transmission, to the worm gear, and thence through a transverse shaft, on the outer end of which is mounted the sprocket that imparts the drive to the track itself. Releasing either clutch makes the track on that side of the tractor inoperative and the track on the other side operates to turn the tractor in a circle. If a shorter turning circle is desired, one track may be operated at low speed by manipulation of the planetary transmission.

### Track Operation

Track operation is effected by large driving sprockets actuated by the worm gears within the body of the tractor. These driving sprockets are at the rear end of the tractor. At the forward end there are blank or idler sprockets of larger diameter than the driving sprockets, the only functions of these being to guide the track and to regulate its tension. There are two track-supporting rollers mounted above a semi-elliptic spring bracketed to the outside of the tractor armor, which carry the weight of the upper part of the track. The tractor has a nominal forward speed of between 10 and 12 m.p.h., and as a result of its great gear reduction and the peculiarities of its track-laying propulsion, is capable of obtaining traction up to any tractive angle and over ground unusually difficult, such as would be found in territory marked by shell craters.

The armor plate forms the body structure as well, there being no frame. The armor has continuous riveted steel joints, except the rear end, which is bolted so that it can be removed to give access to the powerplant.



*Assembly view of powerplant, showing radiator over rear axle*

Quarter-inch steel plate forms the floor of the body. The rear axle is bolted to the sides of the tractor at the extreme rear, the housings of the two worm gears hanging through openings in the floor. To the lower corners of each side of the tractor is fastened the light armor plate structure inclosing the track roller assembly, which includes the track chain and a built-up inverted U-beam in which the track roller mechanism is carried.

The powerplant is bolted directly to the rear axle housing, through the medium of flanges near the ends. The front end of the powerplant rests at two points on the U-beam that carries the control-lever assembly, which in turn is bracketed to the side of the armor plate.

The engine cylinders are block cast, and are of the L-head type, with the cylinder heads removable. The cylinders have a bore of  $3\frac{3}{4}$  in. and a stroke of 4 in., the engine developing 34 hp. at 1700 r.p.m. The firing order is 1-7-2-5-4-6-3-8, No. 1 cylinder being the cylinder nearest the coil box on the right-hand side of the powerplant, looking from the rear of the tractor, and the opposite block numbering 5-6-7-8, No. 5 being opposite No. 1.

Each crankcase is a single casting of aluminum, with the oil base or sump integral. With this type of construction it is necessary to remove the entire powerplant from the tractor if the crankcase is to be removed or internal adjustments are to be made. The camshafts are gear-driven from the crankshafts. The magneto is a special Ford design, built in and made a part of the flywheel.

The fuel supply to the Kingston carbureter is by gravity. Lubrication is by splash, with gravity circulation, no oil pump being required. A brass tube running from the flywheel to the timing gear housing supplies oil for the timing gears and crankcase. The oil is collected by the funnel end of the tube, and, as the timing-gear housing end is

lower than the flywheel housing end, it flows in the direction of the former.

Cooling water is circulated by a centrifugal pump which is driven by the same shaft as the fan, the pump being mounted between the two cylinder blocks. Both the pump and the fan are positively driven through a train of gears off the idler gear interposed between the two flywheels.

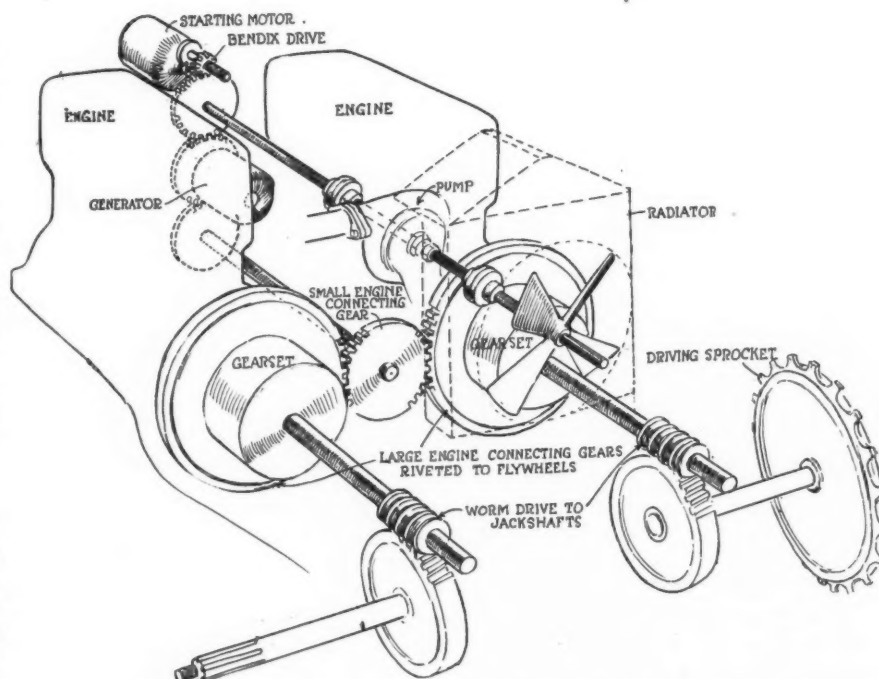
The cylinders are block cast, with integral waterjackets. Each block is drained separately by means of a petcock at the lowest point on the pipes leading from the pump to the cylinder blocks.

The pistons are of gray iron and have three rings each—two above the piston pin and one below.

The piston rings, of which there are three to a cylinder, are of the miter-cut type. All three are tapered from top to bottom; that is, the upper side is slightly smaller than the bottom. This provides a scraping edge to the lower side and prevents an excess of oil passing the piston and reaching the combustion chamber.

The piston pins are solidly clamped in the upper end of the connecting-rods, and oscillate within the bushings in the piston bosses. The piston pin is made of steel tubing, ground to size and case-hardened, and is  $\frac{3}{4}$  in. in diameter.

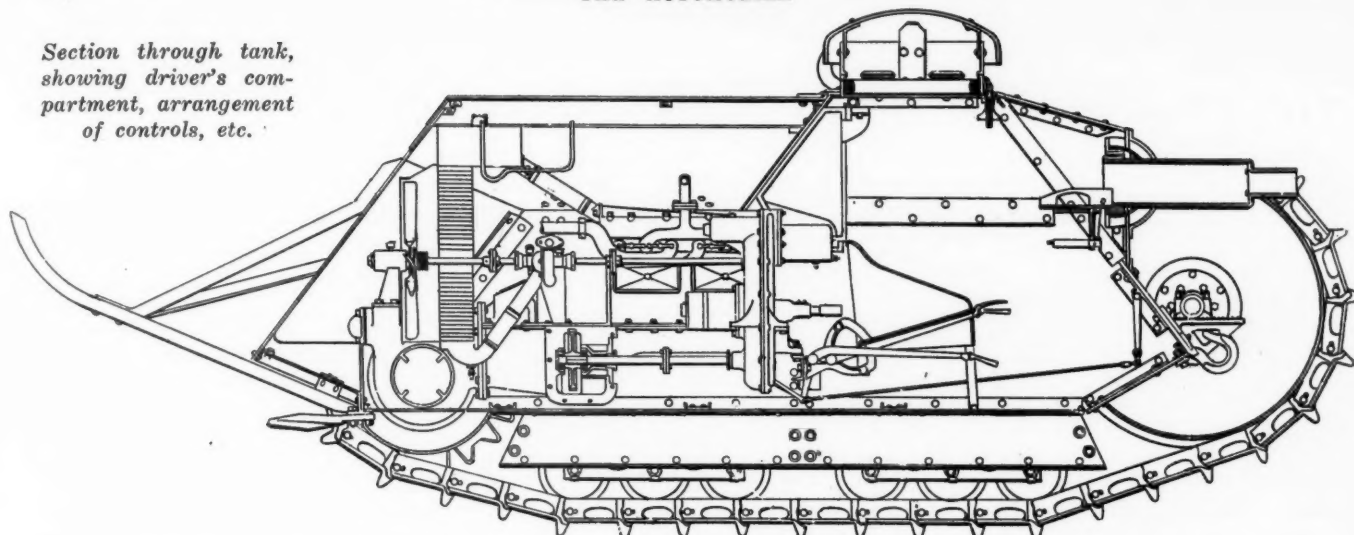
The connecting-rods are of H-section, and measure 9.25 in. from center to center. The material is vanadium steel, drop forged. The large end of the connecting-rod has a poured babbit bearing. The bearing cap is retained by two bolts with castellated nuts and cotter pins. Adjustment for wear can be made by filing off the sides of the bearing cap.



*Sketch showing interconnection of engines and drive to rear axle*



*Section through tank, showing driver's compartment, arrangement of controls, etc.*



The crankshaft is a drop forging, and is mounted in three babbitt bearings. The rear end is flanged to receive the flywheel, which is secured thereto by four cap screws. The front end of the crankshaft is key-seated for a Woodruff key, securing the crankshaft gear. Two oppositely located dowel pins in the flywheel mounting flange prevent the shearing of the flywheel cap screws. The flywheel also serves as the magneto magnet assembly support.

The crankcase is a one-piece aluminum casting. There is a passageway between the two crankcases at the flywheel end, which houses the idler gear between the two engines. A web cast in the left crankcase (looking from the flywheel end) prevents the idler gear (which turns clockwise) from pumping the oil out of the right-hand crankcase. Behind the idler gear is an unobstructed channel which serves to maintain an equal oil level in both crankcases.

The halves of the housing for the flywheel idler are held together by seven bolts with cotter-pinned, castelated nuts, six of these being accessible from the outside of the case, while one of the nuts is inside, directly over the gear. In addition, a cap plate, secured by six cap screws, locks the two crankcases together at the rear. The front ends of the two cases are secured in alignment by the aluminum housing for the train of gears that furnish power for the fan, water pump, generator and starter drive, and also by four bolts to the U-beam carrying the control assembly.

#### Camshaft Bearings

The camshaft has three bearings, all different in kind. The rear one is bronze-bushed, the center one of cast iron, unlined, and the front one babbitted. In assembling the rear bearing is pressed into position and reamed. The front and center bearings are reamed to size and placed on the camshaft before the latter is inserted. Two set screws screwed into the block from the outside hold the front and center bearings from revolving.

There are three manifolds, two exhaust and one inlet. The inlet manifold is cast in three sections, the center section serving as a support for the carburetor and connecting same to the other two sections which are mounted on the respective cylinder blocks.

The water is circulated by a centrifugal pump which is driven by the same shaft that drives the four-bladed fan, from the gear train driven off the idler gear. As in all positively driven fans, a friction clutch

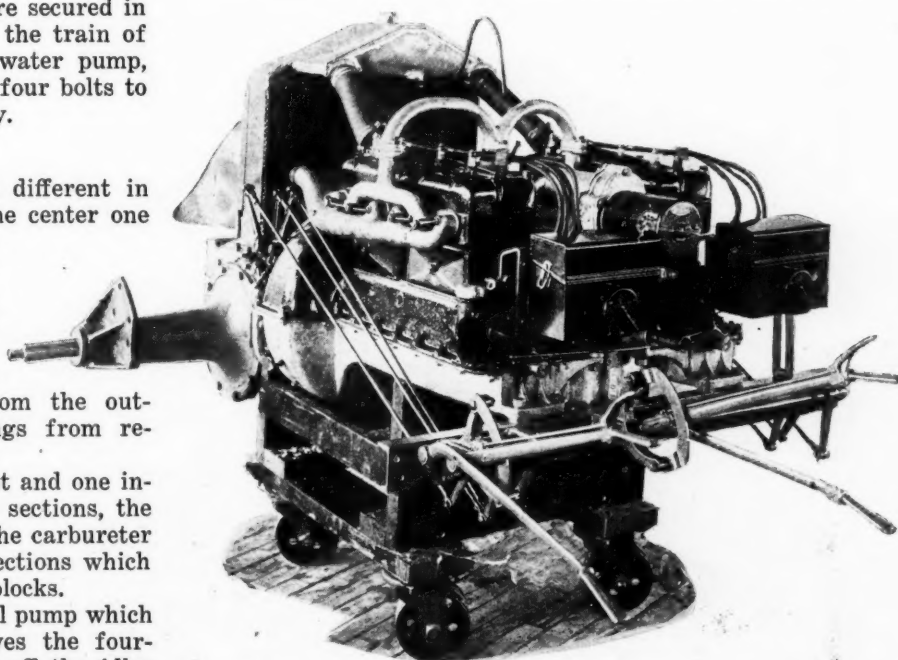
is inserted in the drive to prevent injury to the fan by sudden fluctuations in engine speed. The fan is lubricated by means of a grease cup mounted on the bearing at the extreme end of the shaft. This cup must be turned down daily.

#### Radiator

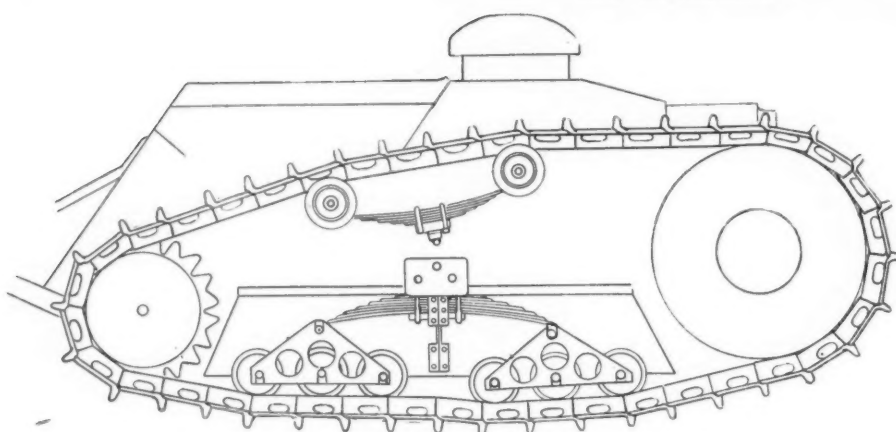
The radiator is a specially built honeycomb type, and is mounted at the rear of the tractor. The fan is located on the side of the radiator, and away from the engines, there being a cored passage through the center of the radiator through which the fan shaft extends. The radiator is mounted upon the rear axle housing, which has fins bolted to it that act as supports. The air for cooling is drawn upward from the lower rear part of the tractor body through a screen, and a housing surrounding the fan is so constructed as to aid in deflecting the air through the radiator core.

#### Fuel System

The main fuel supply tank is mounted in the top of the body, just back of and above the driver's seat. From this tank, which has a capacity of 15 gal., the fuel flows



*View of powerplant from forward end*



Side view of tank, showing spring mounting

by gravity to the carbureter. The fuel tank is of galvanized steel and is protected by armor plate. Between the armor plate and the tank proper there is a felt lining. The armor plate is spot welded together, being made up of several pieces to fit the irregular shape of the tank, which conforms to the outline of the interior of the tractor. The tank and its armor are a unit, which is mounted by two brackets on the armor-plate body. A Donaldson air cleaner is employed.

The 3-ton tractor magneto is of special design, although similar to the regular Ford type. Its magnets are fastened to the flywheel, and the stationary field coils are attached to the cylinder block.

The two 3-ton tractor clutches are of the multiple steel disk type, operating in oil. The interior of the brake drum serves as a support and housing for the steel disks, of which there are twenty-five, twelve driving and thirteen driven.

On the transmission gear shaft is keyed the transmission clutch disk drum, which is machined to receive the lugs of the small or driving disks. The interior of the brake drum is machined to admit the large or driven disks.

The 3-ton tractor final drive is composed of two dis-

tinct worm drives, each operating its own axle shaft, to which is attached the drive sprocket. The worm gears are of bronze and are bolted to a steel spider which is supported by the axle shafts, which are carried by roller bearings revolving within a steel sleeve at the outer and inner ends of the axle housing.

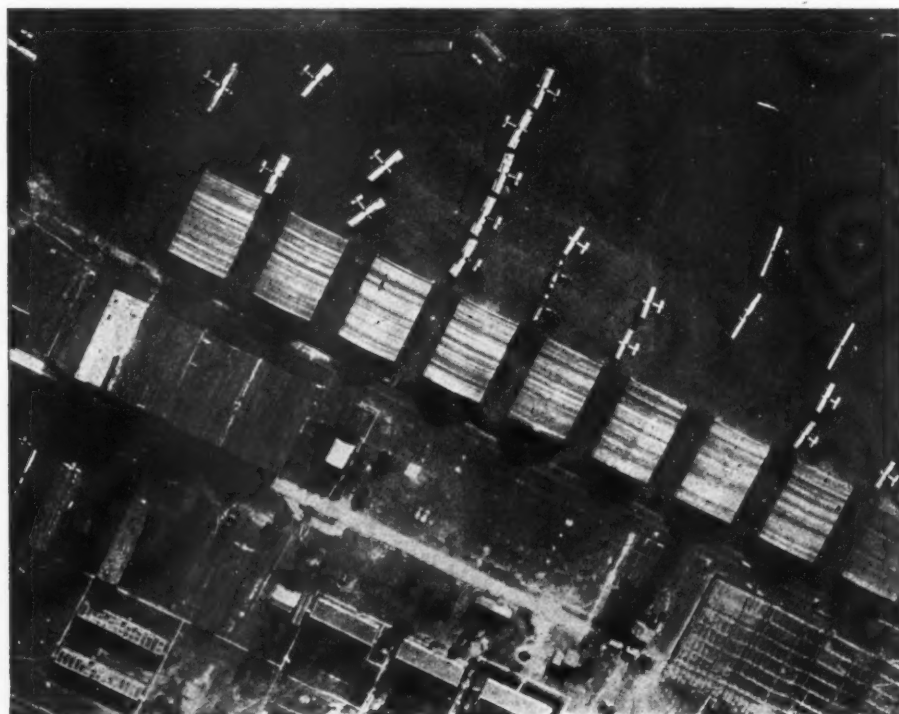
The worm is assembled with 0.010 to 0.015 in. end play and the bearings of the worm must not exceed 1.499 in. nor be less than 1.493 in. Axle shaft bearings should not exceed 1.623 in. nor be less than 1.615. The ratio of the final drive to the engine is  $7\frac{1}{4}$  to 1.

The tracks of the 3-ton tractor form an endless steel roadway over which the tractor travels. They are composed of cast-steel links held together by steel pins. The track pin is held in place by a track-pin keeper—a steel pin similar to the ordinary cotter pin, only larger.

The weight of each track is 390 lb., and the length, when spread out, is 320 in., there being forty links to each track and each link being 8 in. in width.

### Standardizing German Engineering Products

THE movement for standardizing German engineering products is making steady progress. Recently at Vienna, at the instigation of the Society of Engineers and the Ministers of War and Public Works, a committee was formed to carry out the proposed regulations in the several branches of engineering. The sub-committees appointed to deal with tools, screws, pipes, ball-bearings, bolts, and gear teeth have held numerous meetings, and have reached conclusions with regard to those objects of engineering manufacture. Locomotive construction is now under consideration. The scope of the standardizing movement is being extended to canal structures and to shipbuilding. The advantages of an all-round standardizing of engineering products have been made impressively evident by the war conditions through which European industries have passed.



### American Flying Field in France

A most unusual and striking aerial picture taken in the Argonne forest just previous to the armistice. It shows a large American aviation camp with machines ready to fly. This picture has naturally been held up by the French and U. S. censors and was released only recently.



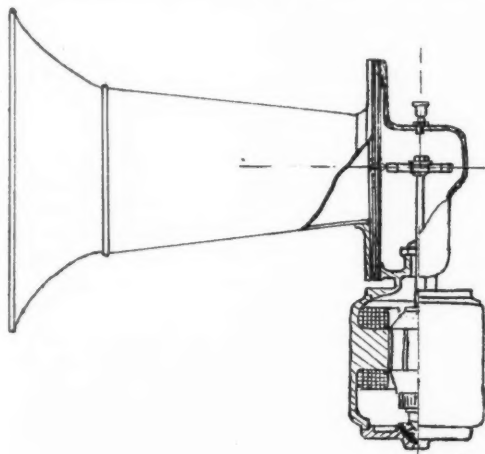
# Electrical and Mechanical Warning Signals for Automobiles

Principles Involved in the Operation of Diaphragm Signals—Relative Advantages of the Electric Motor Horn, the Electric Vibrator Horn and the Hand Operated Horn—Variety in Mechanism of Hand Horns

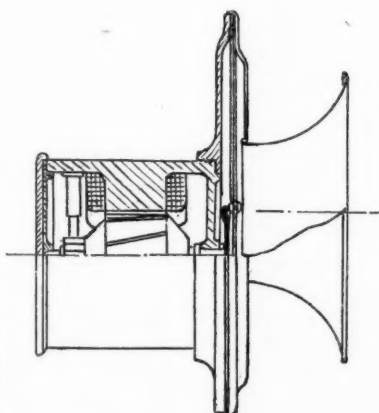
By Fred I. Hofman

THE number of warning and signalling devices indicating the approach of vehicles driven by motive power has greatly increased in the last few years, and though the electrically operated instrument is the predominant one at the present time, still there are a few designs actuated by manual power. The reason why electrical devices are favored lies probably in the simplicity of their operation, for the actuation involves merely the pressing of a button switch on the steering wheel or some place near it. The greater attention required by this type of horn brought, however, a mechanical contrivance on the market with sound-producing qualities not unlike those of its electrical rival,

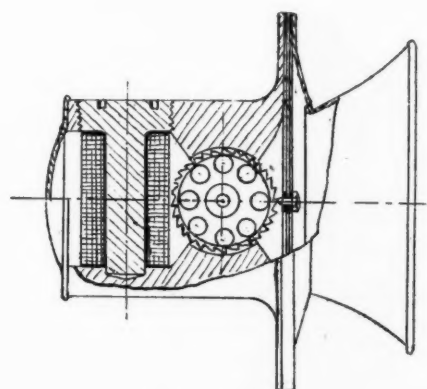
and, considering both price and neatness, it certainly has become a very strong competitor to it. The popularity of the former pattern is no doubt due to the very excellent construction of the small driving motors used in the one class of electrically driven signals and the well-made magnetic vibrator parts embodied in the second. The current for operating same is now easily obtainable from every automobile, and this combined with its steadiness is probably another reason for its popularity. Taking, however, all at its face value, the real advantage is that one is able to alter the duration of the sound at will, and this so far cannot be said of any other mechanically worked horn.



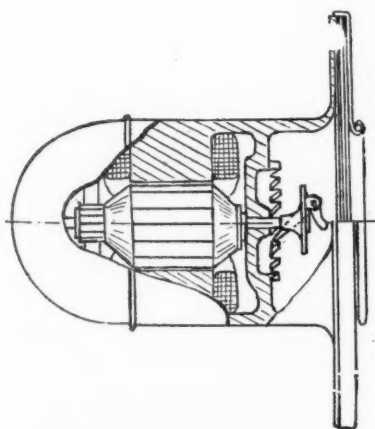
Horizontal ratchet wheel



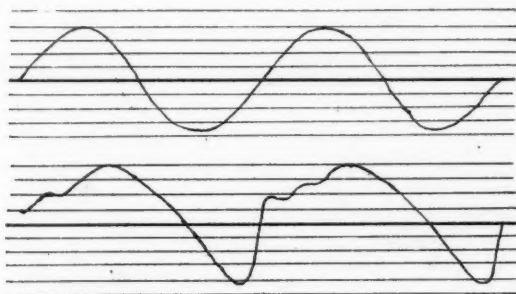
Vertical ratchet wheel



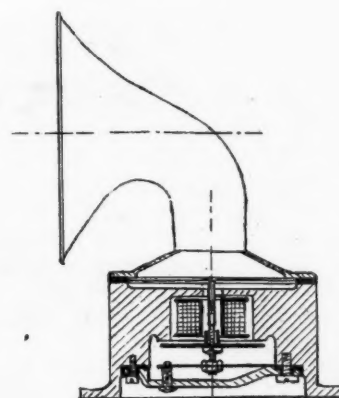
Armature periphery ratchet



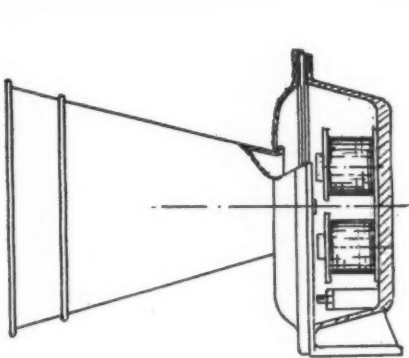
Stationary ratchet, indirect actuating hammer



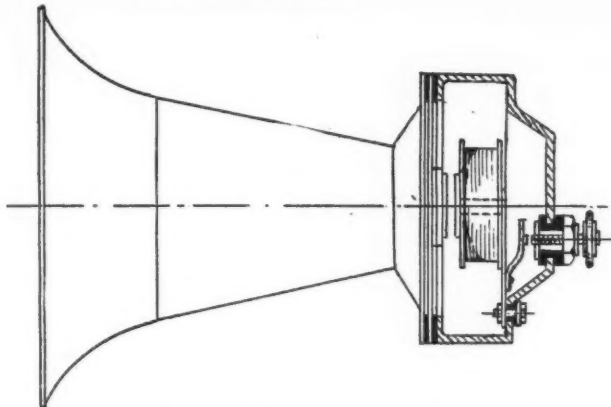
Above: Harmonic note, curve of tuning fork. Below: Curve of vibrator horn, showing chattering or contact blade and sudden acceleration due to magnetic pull



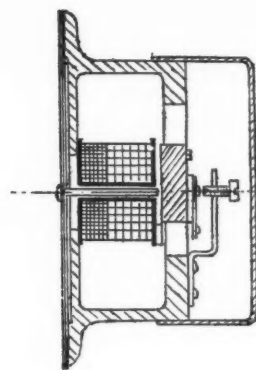
Single casting solenoid vibrator horn



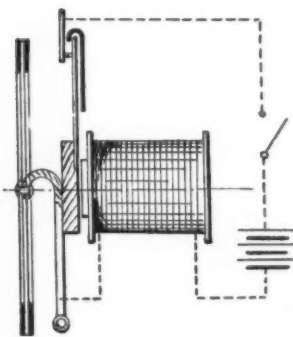
Type of horn with combined armature and diaphragm



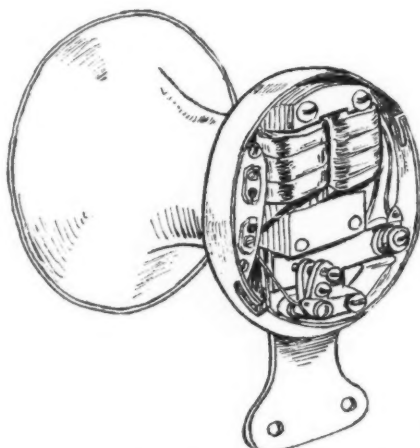
Type of horn with suspended and vibrating magnet



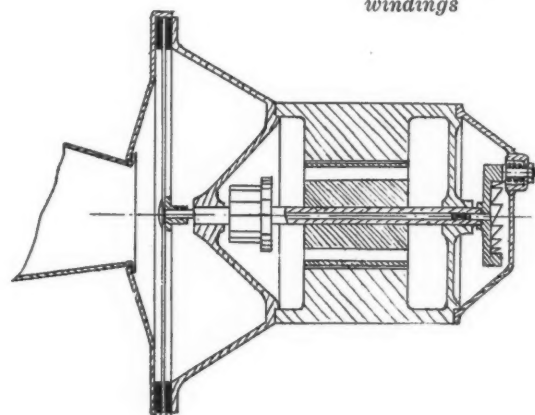
Double-tone, otherwise standard design vibrator horn. Note the two windings



Type having swivel and attached armature



Transformer-coil-shaped vibrator pattern



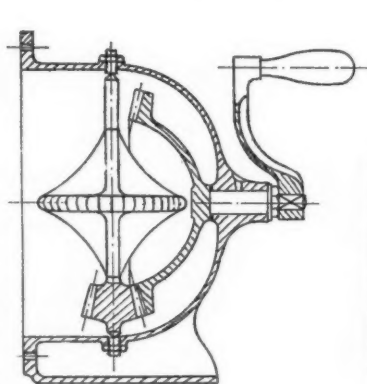
Motor horn giving warning note similar to that of vibrator horn

Warning signals of the electrical type can be subdivided into those that produce vibrations of the diaphragms (a) by a deflecting knock and (b) by a direct oscillatory movement similar to that of a hammer blow. The first named designs are the motor-driven variety and are all alike as regards the main principles involved. They comprise a small motor which is always series-wound on account of the greater tongue of this type, and sometimes works in a field with one or two coils and at other times in a field with permanent magnets similar to those of a magneto. The electromagnet pattern is, however, preferred, as it makes it possible to have a practically closed field case of so-called "ironclad" form and thus save a separate frame or supporting body, which the latter type requires. The armatures of these small motors are built up with from 3 to 12 sections or coils. The spindles run in ball bearings or have hardened and pointed ends revolving on recessed and adjustable screws. The sound actuating part consists in most patterns of a ratchet-like wheel which is fitted on one end of the spindle, or direct on the armature surface. There is, however, one make which is designed to transmit the knocks indirectly through a small governor-like weight agitated by a stationary ratchet.

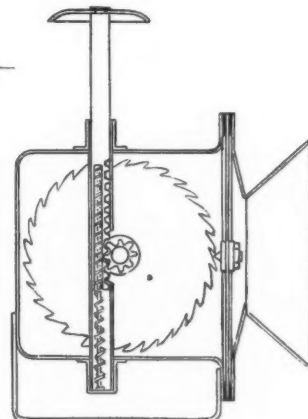
The principle on which the ordinary electric or vibrating pattern horn is based is the same as that of the familiar electric house bell. The constructions differ only in the manner in which the magnetic systems are arranged. The coils are fixed or suspended and may be either single or double. Only the cheapest grades are built with a cast-iron solenoid. Most of the makes employ a continuous coil winding, but there

are in one or two designs circuits with different resistances, so as to break the note and thereby enable the pitch to be altered. The oscillation of the discs is obtained also through quite a number of methods other than those specified above, and some of these are shown in the accompanying sections.

Every maker pins his faith on his own design, claiming it to be the best on the market. Volume of sound, current consumption, simplicity, efficiency and dur-

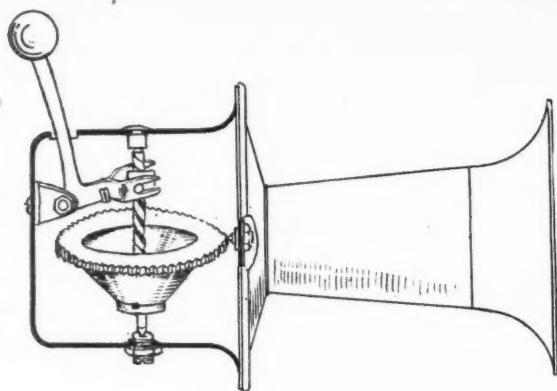


This mechanical horn employs no freewheel clutch and can be moved both ways, left and right. The sound can be prolonged at will of operator. Note the pivot bearings of the wheel shaft

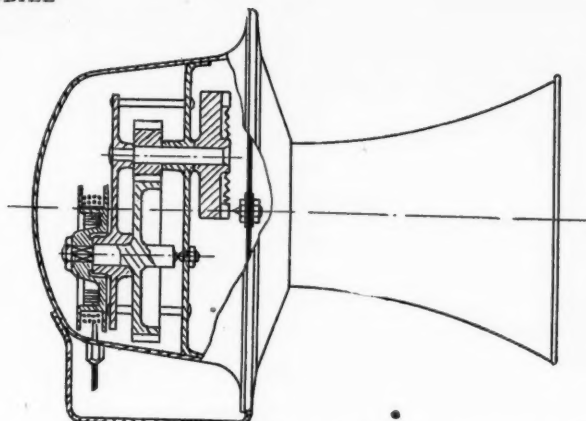


The plunger when depressed sets the small gear and ratchet in motion, and consequently the toothed fly-wheel, which in its turn knocks on the anvil of the diaphragm





*This design contains no gears. The bell crank when moved forward by the operator acts through a pawl clutch on a screw collar on a vertical rod having a very steep thread. The actuator, being solid with the screw, moves direct*



*The impetus given to the serrated driver wheel is obtained by the pull of a spring-operated pulley and cable, and through a double gearing. The spring is of the clock type and located inside the pulley for the cable*

ability are factors for consideration when judging the value of the separate designs.

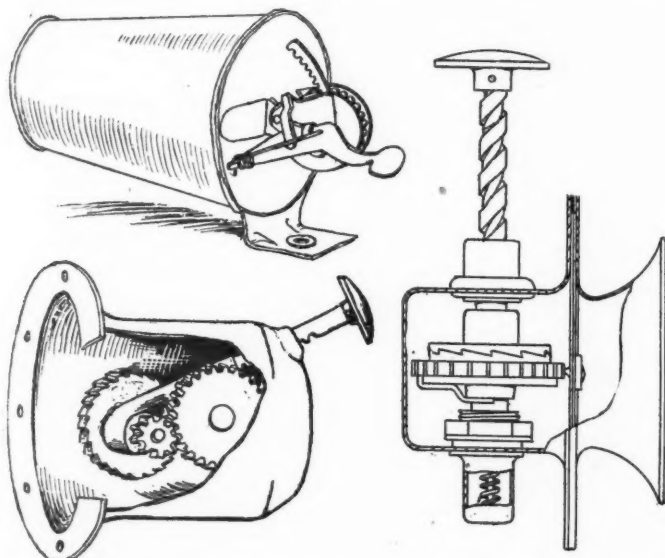
It is well known that one of the major troubles in connection with motor driven horns is the brushgear and in the vibratory magnetic pattern the pitting and sparking of the contact points. Brush trouble is difficult to entirely overcome, whereas sparking of the blades in the vibrator type can easily be remedied by shunting across a condenser. So far sparking has been obliterated by this method in only a few makes.

There exists still another pattern of horn, and that is the type in which the vibrator points against the diaphragm are oscillated by a motor. This, therefore, makes use of both the principles in question.

The diaphragms of most warning signals consist of hardened steel plate, often heat treated or also hammered to give stability, 4-5 in. in diameter and fitted with a cork or thick paper ring on the periphery in order to insulate it from the instrument box on one side and the conically shaped metallic projector trumpet on the

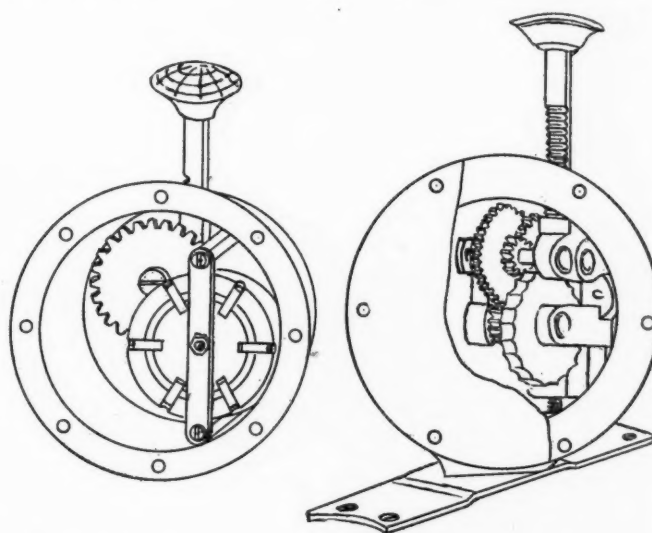
other. A resilient partition layer is made use of so as not to impede or deaden the resonant sound by a direct contact with the steel surface of the body proper. The thickness of the diaphragm varies from one to two hundredths of an inch and is greater for hand than for electric horns. The note produced by the blows is dependent upon the relative thickness of the disc as compared with its diameter. The thicker the metal the higher the pitch; or with a given thickness of metal, the smaller the diameter of the diaphragm, the higher the pitch produced. With the stiffer diaphragm, however, the horn is rather more likely to become inoperative through sticking, and this should be taken into consideration when a tendency to produce a higher tone than normal is observed.

The purely mechanical type of horn, being perfectly enclosed, not prone to get out of order and easily adjusted from outside by simply advancing the anvil on the diaphragm, is very seldom interfered with or opened. To the man in the street, this design looks more like a box of tricks than any other instrument on the automobile and it should be worth while to describe the different constructions and details employed



*Above: The press-down lever, to which is attached a rack, engages with a pinion on the gear. Below: The mechanism in this type contains a double speeding-up gearset and circular plunger cut on one side with teeth*

*The threaded handle of this horn engages a ratchet clutch, and when pressed down turns the special tooth rotator, which displaces the sounding shield*



*In this horn, which embodies also a double train of wheels, the sounding is produced by small hardened rollers*

*This road clearer is the only design using a triple set of gears. The final speed of the flywheel being very great, gives a long sound*

for obtaining the warning sound. It may be mentioned that in general the note is practically the same on all horns and never differs to a great extent.

The movement of the inner sound producing mechanism of these horns is brought into action in different ways by a vertical, oblique, horizontal or rotary thrust from outside. The pressure exerted on the plunger or lever of some construction is then transmitted either directly through a train of gearing to a disc. This disc, with its hardened and ground teeth, is knocking continuously on the hardened pin of the diaphragm while in motion. The gears used in the horns are of 32 or 24 diametral pitch and of steel. The spindles are of the plain pattern running

on hardened steel brushes, less often on centers. Those designs using a geared-up movement have the whole of it fitted in a die-cast frame, whereas the single designs often make use of the steel outer casing as bearing support. The speeded up pattern horn is, of course, a more rugged and reliable job, but the one gear type is simpler, less liable to get out of order and cheaper to manufacture.

The amount of ingenuity displayed by the manufacturers in producing warning signals of both the electrical and mechanical type is astonishing and this will be best appreciated by studying the constructions of some of the leading and best advertised makes fully described in this article.

## Four-Inch Guns Mounted on Motor Truck

By W. F. Bradley

**T**HE biggest gun carried on and fired from an automobile chassis is an Italian weapon built by the Ansaldo company on a special truck chassis manufactured by the S. P. A. Co., Turin, Italy. This automobile gun was brought out soon after Italy entered the war, and has been made use of with very satisfactory results throughout the operations against Austria.

The gun is of 102 mm. bore (practically 4 in.) and fires 17 rounds a minute, with a range of 11 miles. The chassis follows standard lines of construction, and except for heavier frame members and a set of quick-acting jacks does not differ very much from the ordinary 4-ton truck built by the S. P. A. company.

The motor is a four-cylinder monobloc casting of 100 by 200 mm. (3.9 by 7.8 in.) bore and stroke. In accordance with the usual S. P. A. design, the water pump is inside the cylinder casting, instead of being a separate housing. As the cylinders have both an intake and exhaust manifold cast integrally, with valve stems inclosed, the appearance is remarkably clean. The drive is taken through a disk clutch, a four speed and reverse transmission, with final drive by side chains in metal housings. The wheels are cast steel, shod with single and dual solid rubber tires of Goodrich make.

The gun is mounted on the truck platform, back of the driver's seat, and when not in use is carried with its muzzle pointing forward between the driver and the mechanic. As the barrel of the gun is of considerable length, its mouth is practically flush with the radiator cap.

Being mounted on a pivoted platform permanently attached to the chassis, the gun can be swung in any direction when going into action, and is only placed in the pointing forward

position when on the road. This position, incidentally, gives the best distribution of weight.

Under the frame members of the chassis are two quick-acting screw jacks, which are made use of to raise the chassis so that all load is taken off the springs when the gun goes into action.

Protection is provided for the motor by means of 8 mm. chrome nickel steel armor plating in the form of a hood. Ample louvres are provided on front and side to assure a cooling draft of air. There is a gunner's shield, but no protection for the drivers. The vehicle is practically fireproof, for no wood whatsoever is used in its construction; the dashboard is metal and the wheels, as already stated, are cast steel. The gasoline tank is under pressure, so that in case of its being punctured or the line broken the fuel cannot flow to the exhaust pipe or other hot parts of the car.

The 102 mm. automobile artillery is formed into batteries with four guns to a battery, the whole being served by automobile transportation. In addition to the four gun cars there are twenty other vehicles, comprising telephone and signal car, mechanical workshop, and munition cars, all of them being of the one type. The commanding officer has a car and is attended by two motorcycle dispatch riders.

The entire battery of four guns and 20 supply cars is automobile mounted, and the automobiles are all of one type. This simplifies the work of maintenance and enormously reduces the quantity of spare parts to be carried. Every car in the battery has armor plated hoods, and in addition the ammunition cars have armor plated bodies. Each ammunition car carries the two drivers and four men seated on a broad seat at the rear.



Italian 4-in. motor artillery



Sighting the motor-mounted gun



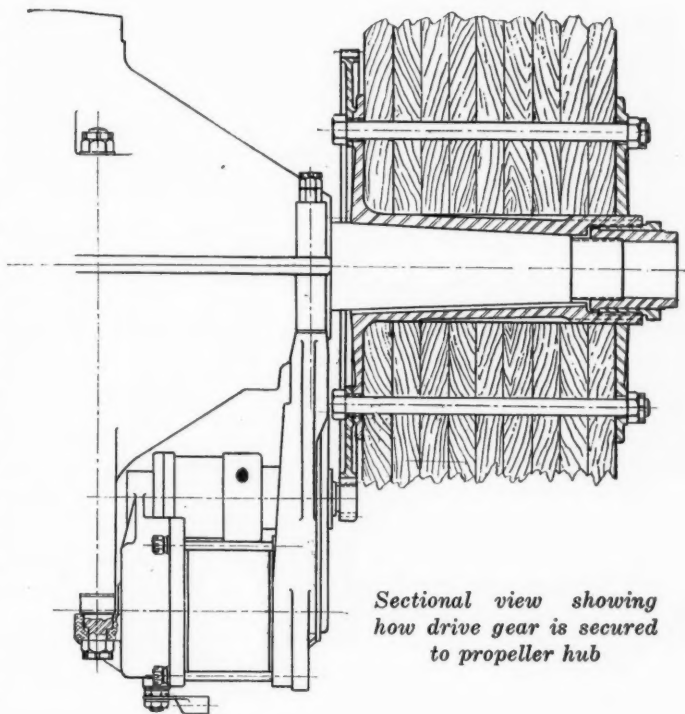
# Bijur Starters for Seaplanes and Blimps

Fitted to Liberty Engines at Propeller End and Crank Engine  
Through a Double Reduction Gear with Bijur  
Automatic Screw Shift

**A**MONG the war-time developments in the automotive field regarding which nothing has hitherto been published are the electric starters built by the Bijur Motor Appliance Company for the Liberty and other aeronautical engines, and supplied in some quantity to the Navy. Until recently there has been a federal injunction in force prohibiting the disclosure of this device without permission of the Secretary of War or of the Navy, but this has lately been vacated.

As will be noted from the accompanying illustrations, this device embodies several interesting features. The mechanism consists of a relatively small electric motor, of special design, fitted with a double gear reduction and a special form of the Bijur automatic shift. This mounts directly on the crankcase at the propeller end of the production Liberty engine, without the use of intermediate brackets and without making necessary any alteration to the engine. To mount the Bijur starter on the Liberty engine, two nuts at the base of the cylinders nearest the propeller end (marked A in illustration) are removed and special extension studs are screwed on. Two lugs on the starting motor casing fit over these and are retained by the original engine nuts, which are put on the extension studs. The two end bearing bolts at the extreme propeller end of the engine crankcase (marked B in illustration) are removed and are replaced by two long studs which project from the starter housing.

Normally there is no connection between the starting motor and the crankshaft. A gear ring is placed inside the propeller hub flange and held by the regular propeller bolts passing through holes jig-drilled for the purpose. The pinion of the starting motor is normally retained within the housing. When the starting switch is depressed the pinion meshes with the teeth of the gear ring and cranks the engine. The starting of the engine under its own power automatically unmeshes the pinion. Provision is made against the possibility of the teeth jamming, and they will not mesh with the gear



Sectional view showing  
how drive gear is secured  
to propeller hub

ring if the switch is depressed while the engine is running. The use of an eight-tooth pinion is something of an innovation and makes possible a high gear reduction.

The Bijur Liberty starter was originally designed for the

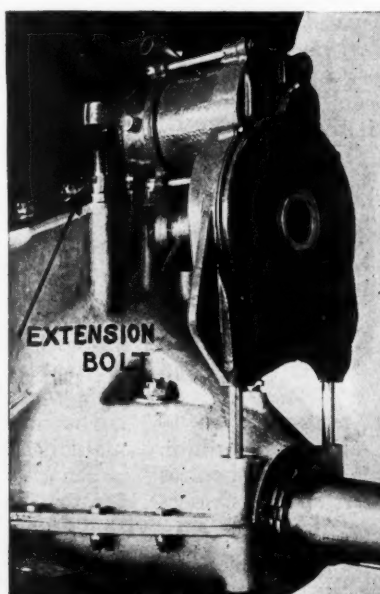
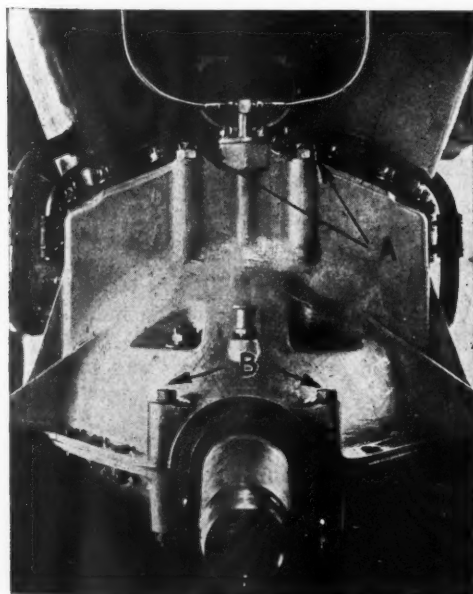
Navy for use especially on seaplanes. At the suggestion of the Airplane Engineering Department of the Signal Corps the design was made such as to obtain a starter of minimum weight and current consumption combined with a maximum of cranking power. It was thought that this requirement would, of necessity, entail cutting down the cranking speed to a very low value, but this was found not to be the case. The success of the design as produced will be evident from the following data:

Weight of starting motor, 20.5 lb.  
Normal cranking current, 100 amp.  
(12-volt battery).

Maximum torque available on engine crankshaft, 1300 lb.-ft.

Normal cranking speed (crankshaft), 40-50 r.p.m.

The reason for choosing the propeller end of the engine on which to apply the starter was that it makes possible the use of a simple and sturdy form of drive without clutches or couplings. It also makes use of space not available for other purposes.



Bijur starter mounted on Liberty aircraft engine

# Organization and Work of the Motor Transport Corps

**¶ In Complete Control of All Vehicles Used by the A. E. F.—Maintenance Problems Aggravated by Number of Different Makes—Had to Provide 3000 Parts for Each New Vehicle Put in Service—Trucks Delivered Overland an Average of 380 Miles.**

By W. F. Bradley

AUTOMOTIVE INDUSTRIES' European Correspondent

**H**AD America been a professional fighting nation, with every detail of its army organization perfected in theory and in practice, the task of providing automobile transportation for an expeditionary force of more than 2,000,000 men would have been a man-sized job.

But when Uncle Sam rolled up his sleeves his entire knowledge of automobile transportation under war conditions had been gained on the Mexican border and from very meagre official reports from Europe. The very little motor transportation he possessed was in the hands of the Quartermaster Corps and was altogether inadequate for a great European war.

When that steady stream of traffic began to flow across the Atlantic every individual organization fought for shipping space, and the most powerful got it. The automobile service being technically non-combatant and influentially weak, got squeezed out until the more powerful army organizations in France began to realize that by leaving the automobile service in the rear they had been abandoning their most valuable ally.

Thus, while automobile men in America were laying wonderful plans for standardized trucks, the automobile men in France were scouring the country for anything which had wheels and burned gasoline. They found these cars and trucks in France, in Italy, in England, in Spain, and even got some "orphans" born in Germany and Holland.

So, while it can be considered a man-size job to run an automobile service for a two-and-a-half-million army, when the organization is perfect and the supplies are regular, it has to be admitted that it adds considerably to the complexity of the task when it is necessary to organize a service and run it at the same time, when the main source of supply is 4000 miles away and unprepared, when the lines of communication are open to attack, and when the unsatisfactory expedient of

## Total Vehicles in Use by the A.E.F. on Dec. 15, 1918\*

Passenger Cars .....	7,575
Motor Trucks .....	32,500
Trailers .....	4,300
Motorcycles .....	18,000
Bicycles .....	19,000
<b>Total Vehicles .....</b>	<b>81,375</b>

### Makes of passenger cars—

Foreign .....	51
American .....	26

**Total different makes .....** 77

### Makes of motorcycles—

Foreign .....	5
American .....	3

**Total different makes .....** 8

### Makes of American trucks—

1½-ton .....	23
3-ton .....	21
6-ton .....	5

**Total different makes .....** 49

### Makes of trailers—

Foreign .....	34
American .....	20

**Total different makes .....** 54

*\*The figures given in this table were obtained by W. F. Bradley from the Director of Motor Transport Corps, Overseas Division, and are official.—EDITOR.*

begging vehicles from whatever European factory can furnish them has to be indulged in.

It was about a year ago that the army automobile service was taken out of the hands of the Quartermaster and vested in the Motor Transport Service, later, and at present, known as the Motor Transport Corps.

Boiled down and stripped of its legal and military phraseology, the general order which brought this change into effect gave the M. T. C. complete control over all motor vehicles in the Service of Supply of the American Expeditionary Forces and entrusted it with technical supervision over motor transportation in the zone of advance.

The organization is distinctive, differing entirely from that of the French Army and only corresponding in a general sort of way with that of England. The Overseas Division of the Motor Transport Corps has at its head Brigadier-General M. L. Walker, with headquarters of the corps in the town of Tours, less than half way up the main line of communication.

To give an idea of the size and importance of the Motor Transport Corps, it is only necessary to state that it has under its control about 81,000 vehicles, composed of 7575 passenger cars, 32,500 trucks, 18,000 motorcycles, about 4300 trailers and 19,000 bicycles. These, together with the stock of spare parts, tools and machinery which were in hand at the date of the armistice,





This "Western" town was built by the Motor Transport Corps in France. These are barracks and offices for men. One sees such groups of buildings every 5 or 6 miles along the lines of communication

represent a value of not less than \$175,000,000. At the same date, the number of enlisted men in the Motor Transport Corps of the entire A. E. F. was 20,392, and the number of officers, 1032.

The Motor Transport Corps has charge of all the automobile transportation of the American Expeditionary Forces. In the early days, some of the corps had their own transportation. The most conspicuous example was the Aviation Section of the Signal Corps, which got together quite an important fleet of automobiles before the present M. T. C. came into existence.

It was felt that there should be an automobile service for the entire army, and not a separate service for each corps. The pooling of the automobiles met with a considerable amount of criticism, particularly from those services which had got automobile transportation together before the M. T. C. was formed.

This system of pooling is undoubtedly the most economical in the long run, for it simplifies supply and main-

tenance, and puts vehicles in service just where they are wanted. With divided control one set of vehicles may be idle or only partially employed, while a neighboring set is overworked or so inadequate in numbers that the efficiency of the whole army is impaired.

This system of pooling has been developed to an even greater degree in the French Army than in the American Forces, notwithstanding the fact that the French run a practically independent motor transport corps for aviation and artillery.

The work of the Motor Transport Corps was rendered difficult by reason of conditions for which the nature of the war alone was responsible. Troops and primary necessities were brought over faster than automobiles and automobile supplies, with the result that the first American forces to land in France went out and bought whatever happened to be available.

For any organization whose work was held up for lack of trucks and cars it was the most natural thing in

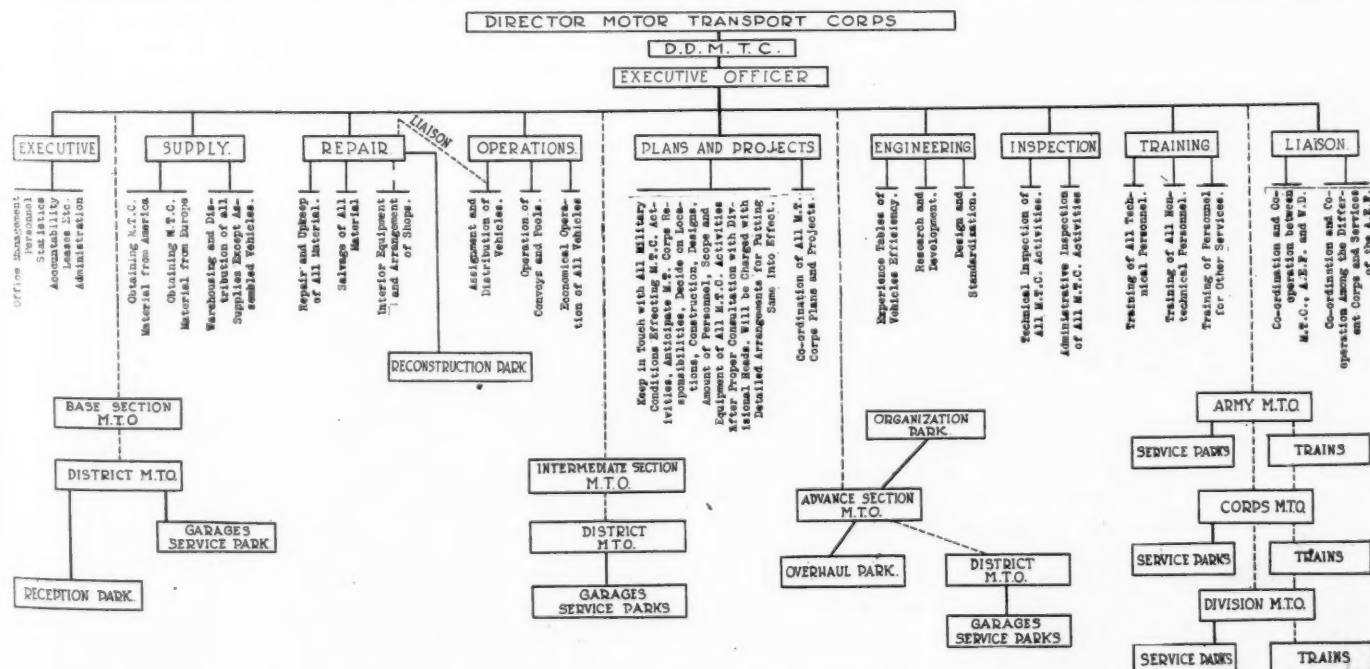


Chart showing the general organization of the Office of the Director of Motor Transport Corps. The solid lines represent direct control; the dotted lines, technical control



*These Army police stop all cars and verify travel orders. At every street corner in the ruined towns and cities in the war zone these military police direct traffic with the same dispatch as at Fifth Avenue and Forty-second Street, New York, or Michigan and Jackson Boulevards, Chicago*

the world to buy an urgently needed car without inquiring too closely how supplies were going to be obtained later to keep it in condition. Thus, the army which has made the greatest efforts toward standardization has at the present time fifty-one makes of foreign passenger cars, three makes of American motorcycles and five foreign makes. There are twenty-six different makes of American passenger carrying automobiles, twenty-three makes of 1½-ton trucks, twenty-one makes of 3-ton trucks, six makes of 5-ton trucks, thirty-four makes of American trailers, and at least twenty European makes.

Before some of the "orphans" were salvaged, there were 169 different makes of passenger cars—American and foreign—to be cared for.

#### **Welfare Organizations Own 66 Foreign Makes**

Outside organizations, such as the Y. M. C. A., the Salvation Army, K. of C., etc., own sixty-six foreign makes of cars or trucks and twenty-nine different American makes, all of which the Motor Transport Corps has to father. Many of these trucks and cars are altogether unknown to Americans at home and only slightly known to Europeans. This purchase was made under absolute necessity; but their maintenance always will be a very serious problem for the M. T. C.

A variety of types of automobiles is inevitable, no matter how thoroughly the standardization idea is followed. The M. T. C. is responsible for the motor transportation of the army with the exception of kitchen trailers, which belong to the Quartermaster; tanks, which are under the control of the Ordnance Corps, and a very small number of special vehicles for the Air Service.

Originally, some of the branches of the service had their own transportation, the most important of these branch transportation services being that of the Air Service. When they were all grouped under the M. T. C. a list was very carefully prepared of necessary types to cover the needs of the entire army, and although this list assumed that there would be but three makes of passenger cars it totalled 112 different types of cars, trucks and trailers. Later, by close team work, it was possible to reduce this number to rather less than 100 types which were essential to the needs of the army.

It is absolutely impossible to keep stocks of parts of every "orphan" car which gets into the service under

dire necessity. But complete stocks are kept for forty-one makes of cars and trucks. This means that there are forty-one different makes of automobiles for which the M. T. C. is prepared to supply at a moment's notice any part liable to need replacement.

This supply organization is immense, for the number of parts listed and always on hand to meet requisitions total 90,000. No other branch of the service has anything like such a huge stock. It is believed that the engineers come second, but their stock of listed live articles is not half that of the M. T. C.

#### **Substitute Parts Cannot Be Offered**

Further, the M. T. C. list cannot be reduced nor can substitutes be offered. If the Quartermaster is out of beans, he can recommend rice as being just as good, but the M. T. C. supply officer who receives an urgent requisition for a French Renault crankshaft is unable to put forward a dozen Ford shafts in its stead.

The great cry in the M. T. C. is for standardization, and it is toward this end that they are working. With every new make of car which goes into service the possibility has to be faced of providing 3000 individual parts as replacements. So serious is this problem that M. T. C. supply officers would prefer to have in use one indifferent make of truck rather than an equal number of good trucks produced from six different factories.

Since the critical days when anything and everything on wheels had to be accepted and pressed into service, without any thought as to how long it could be kept running, a very complete system of supply has been evolved, under which every shipment, every package, can be traced from the moment it leaves America to the time it enters the main supply park 4000 miles away.

There were times when a truck or car having failed on account of some minor breakage had to be abandoned for lack of a replacement, and within a few weeks had been picked as clean as ever vultures picked a corpse on the desert. Now parts can be supplied on order; in some cases when they are not available from America, the M. T. C. manufactures them on the spot.

From the American Army standpoint, the whole of France is divided into three main portions. Around the coasts there are a series of base sections, numbered Base Section No. 1, Base Section No. 2, etc. Nearly the whole of the central portion is known as the intermediate section, and further to the east is the advance section, with



*This Holt is working in its natural element—mud*





*German prisoners making roads for the Motor Transport Corps. Every road used by our motor trucks was kept in repair by gangs of workers spending all their time on them. This applies to every road in France*

the actual battle front on its outer edge. The Motor Transport Corps receives its trucks and supplies at some or all of the base ports beginning with Marseilles in the south and ending with Havre in the north.

At practically each one of the base sections there is a big reception park at which the trucks and touring cars are received, unboxed, assembled, greased and prepared for the road. Owing to the shortage of railroad freight cars, all automobiles landing in France are sent to the front overland.

There is a single receiving station conveniently placed in the rear of the American armies, to which station all these trucks are delivered, and from which point they are distributed to the forces in the field. At this receiving station there is space available for storing 4000 vehicles, but as the American forces in France have always been far short of authorized motor transportation for the number of troops on hand, it is manifestly impossible to keep a reserve at this station. Urgent demands for motor transportation necessitated that vehicles be assigned as rapidly as they were made ready for issue.

The distance to be covered on these driveaways varies with the port from which a start is made, and averages about 380 miles.

Convoy routes have been mapped out from each port to the central distributing station, gasoline and service stations have been established along these routes, and all the roads have been marked with signs in English. To relieve the railroad shortage as much as possible, useful loads are always carried. Preference is given to M. T. C. stores, which have to be dropped en route or at the destination; but if no M. T. C. supplies are available, any load is picked up for any other corps, and, if necessary, the truck train will go a little distance out of its way in order to deliver these goods.

#### **Truck Trains Always Running**

During the whole of the summer of 1918 these truck trains were running from the base ports to the northeast of France without a break. As each one left, a telephonic communication was sent to the headquarters of the M. T. C., and every evening each officer in charge of a truck train telephoned his location to the main office.

In this way the commanding officer had continuous control over all the many truck trains proceeding from

the south, the west and the northwest toward that main distributing station just in the rear of the American Army.

Usually, officers and men were engaged continuously on the task of bringing up trucks from the base ports to the front. Immediately one trip was finished they got aboard the train, returned to the port, and set out with another convoy. In some cases, however, where personnel was short and trucks urgently needed, the organizations for which they were intended sent their own men down to the port to bring the truck train up. The fine road system of France made it possible for a wonderfully reliable and efficient organization to be established; without these roads, or with indifferent roads, thousands of tons of freight would have been thrown on a congested railroad system.

#### **M. T. C. Has Technical Supervision**

Under the American Army system, the Motor Transport Corps has technical supervision of all motor vehicles; it is responsible for the procurement, reception, storage and maintenance of all motor vehicles and parts; it has to establish and operate all M. T. C. garages, parks, depots and repairshops; it has charge of the technical training of personnel, and the salvage and evacuation of damaged vehicles. It is responsible for the operation of what are known as Class "A" vehicles—that is, automobiles and trucks used in the S. O. S.—under instructions from the proper commanding officer as to their employment.

When motor vehicles are assigned, in accordance with tables of organization, to such organizations as divisions, corps troops and army troops, they become known as Class "B" vehicles, and the rôle of the M. T. C. with regard to them is limited to technical supervision and maintenance.

At first sight, this would appear to diminish the importance of the Motor Transport Corps. In reality, however, this is not so. Even in the service of supply, where the Motor Transport Corps operates its own vehicles, the M. T. C. officer who controls the vehicles has no authority to determine the use to which they shall be put.

It is his duty to guarantee that the vehicles shall perform as efficiently as possible whatever work the commanding officer chooses to assign to them. When the vehicles are assigned to a combatant unit and moved



*General and Colonel entering Cadillac staff car in France. The Cadillac limousine is seen everywhere on the roads behind the American Army in France*

from the S. O. S. to the zone of advance, the Motor Transport Corps no longer has to provide the personnel and has no control over the work which these vehicles shall perform.

Full authority is vested in the commanding officer of the division, corps, squadron, group, etc., to use these vehicles on whatever work he may designate. But while having no voice in the tactical use of the motor vehicles, the M. T. C. maintains a very broad technical control; it supplies information on the proper methods of operation, care and maintenance, and has authority to enforce these methods.

#### Maintenance of First Importance

Maintenance of transportation nearly always comes as an afterthought. The first need is transportation, and after that has been provided necessity compels provision for its maintenance. Scores of examples of this have been found in the history of the American Expeditionary Forces in France.

The first attempt to solve the maintenance problem begins with the operator of the vehicle and the few simple tools placed at his disposal. This soon becomes inadequate, and the next step is to attach to a given number of vehicles a selected mechanic with an increasing number of tools. Then comes the service park, which provides maintenance of a more highly skilled character. The machine shop truck (or trailer) practically corresponds to the service park organization. Next in line comes the overhaul park, and, finally, the reconstruction park, which has as its main purpose the rebuilding, salvage and remanufacture of motor equipment.

The two most important reconstruction parks in France take care respectively of foreign made vehicles and light and heavy aviation trucks, and of all American built automobiles and trucks. This latter park is a huge organization with a staff of about 5000. It receives wrecked material by train load from the front; it undertakes the repair of this ma-

terial wherever possible, and salvages it when its condition does not warrant rebuilding. The reconstruction park handling foreign built vehicles works on the same general lines, but on a smaller scale.

There is this unsatisfactory feature about the M. T. C. as it is organized in the American Army, that it only gets a vicarious kind of credit for the real work it performs. There are, however, plenty of occasions when the action of motor trucks has contributed largely toward saving the situation.

#### Trucks Saved Chateau-Thierry

When the German armies made their drive in the direction of Chateau-Thierry, and it looked as if the road to Paris were going to be opened by way of the Marne Valley, an entire division, with all its supplies, was moved from the east to this threatened point by means of motor transportation, and then moved back again when the danger was over. Truck trains carried fresh troops right up into the battle line; a few days later they carried those shattered troops back again; then came up with more fresh troops, thus keeping up such a steady supply of men and material that finally the morale of the enemy was broken.

From the day when the attack was launched on the St. Mihiel salient to the signing of the armistice the automobile service was kept going at full pressure practically day and night, and again contributed in a very important measure to the success of the armies.

The signing of the armistice brought little change in the work of the M. T. C. While there were no munitions to carry, the general supply of food had to be kept up and lines of communications were lengthened. The first few weeks following the cessation of hostilities brought calls for more jam and less hardtack—luxuries were needed where they could be dispensed with during actual fighting—and the M. T. C. had to meet this demand.

So long as an army of occupation remains, the M. T. C. will be kept busy; probably, too, when reconstruction begins an enormous amount of work will be thrown on the Motor Transport Corps. While the American Army remains in France it is intended to give to the men vocational training. The M. T. C. will do its share in this by training men as drivers and skilled mechanics.



*Bridge over the Meuse at St. Mihiel used much by the Motor Transport Corps in September, 1918, during the great American drive. The original bridge was destroyed by the Germans. One truck at a time went over this bridge*



# Determining Gasoline in Natural Gas\*

## Description of a New Absorption Method Evolved at the Bartlesville Experiment Station

By W. P. Dykema and Roy O. Neal

IN its endeavors to minimize the gasoline losses at absorption and compression plants, which extract gasoline from natural gas, the Bureau of Mines has, through its Bartlesville Experiment Station staff, made a particular study of the apparatus to be used to determine such losses. This paper deals with a method of testing natural gas for gasoline content, which has been found satisfactory in testing rich or lean gases from wells or the residual gas of compression or absorption plants.

The natural gas gasoline industry has had a rapid growth since 1913, when the first absorption gasoline plant was erected for the extraction of gasoline from natural gas, and is now not only being applied successfully to dry gas but also to wet or casing-head gas, still vapors, and residual gas from compression gasoline plants.

According to J. D. Northrop (United States Geological Survey report) in 1917 there were 102 plants using the absorption process in the United States, which had an annual production of 49,017,549 gallons, valued at \$9,592,026. This process has been one of the most important developments in the natural gas industry, for it has not only saved and utilized what was formerly wasted, but has helped producers to meet the ever increasing demand for motor fuels.

### Tests of Small Samples Unreliable

Tests of small samples of gas by specific gravity determination, change in volume of gas in contact with an absorption medium, or increase in volume of absorption menstruum merely indicate the quantity of gasoline in the gas and often lead to ambiguous results. The only accurate method of determining the gasoline content of gases that contain less than a gallon of gasoline per thousand cubic feet is to allow a given quantity of the gas to come in contact with some absorption medium and to separate the absorbed gasoline from the oil by distillation. The method outlined in this paper is effected by using an absorption apparatus that differs somewhat in design from any previously described, although it embraces the same principle of operation—that of the Friedrich wash bottle. This absorber, designed by the senior writer, has the advantage of being a rigid unit, with a large capacity for oil and consequently a larger gas capacity. By using larger volumes, more representative determinations can be made and the opportunities for error are materially decreased.

Before a plant for recovering gasoline from natural gas is constructed, the quantity and quality of the gas to be used should be thoroughly examined. Often one sees plants that because of the lack of adequate testing of the gas were erected only to be abandoned as complete failures after a short period of operation. At present, there is no excuse for such conditions existing as a result of inadequate preliminary examination of the gas to be treated. Too much emphasis cannot be placed upon the importance

of testing gas before the construction of a plant is planned.

The apparatus shown in Fig. 1 consists of a piece of 6-in. casing with five separate compartments, each of which is connected with a  $\frac{3}{4}$ -in. gas inlet and also with a 2-in. gas discharge pipe or separate chamber which extends to a point near the bottom of the casing. From the casing runs a  $\frac{3}{8}$ -in. pipe coiled around a 3-in. core with seven turns, through which the gas being treated bubbles and in which most of the absorption takes place. Some small modifications and additions, optional in the design and not shown in the sketch, are the use of needle valves at each extremity of the apparatus in order that gas may not be introduced too rapidly or may be throttled to any desired pressure so as not to carry oil over from one compartment to the next; also the use of a needle valve on the discharge end to enable one to regulate more easily the rate of flow through the meter, especially in tests at low pressures, that is, when the gas flows through the absorber very slowly. It is advantageous to use gate valves instead of drain cocks for drawing off treated absorption oil from the oil chambers, as such valves facilitate rapid work and eliminate the possibility of volatilization losses when oil is allowed to spray through a stopcock under pressure into the container for collecting treated oil. Also time can be saved by using small bull-plugged nipples, in place of standard plugs, as they can be more easily removed and more rigidly connected to prevent leaks.

To make the test with this absorber, 2700 cc. of mineral

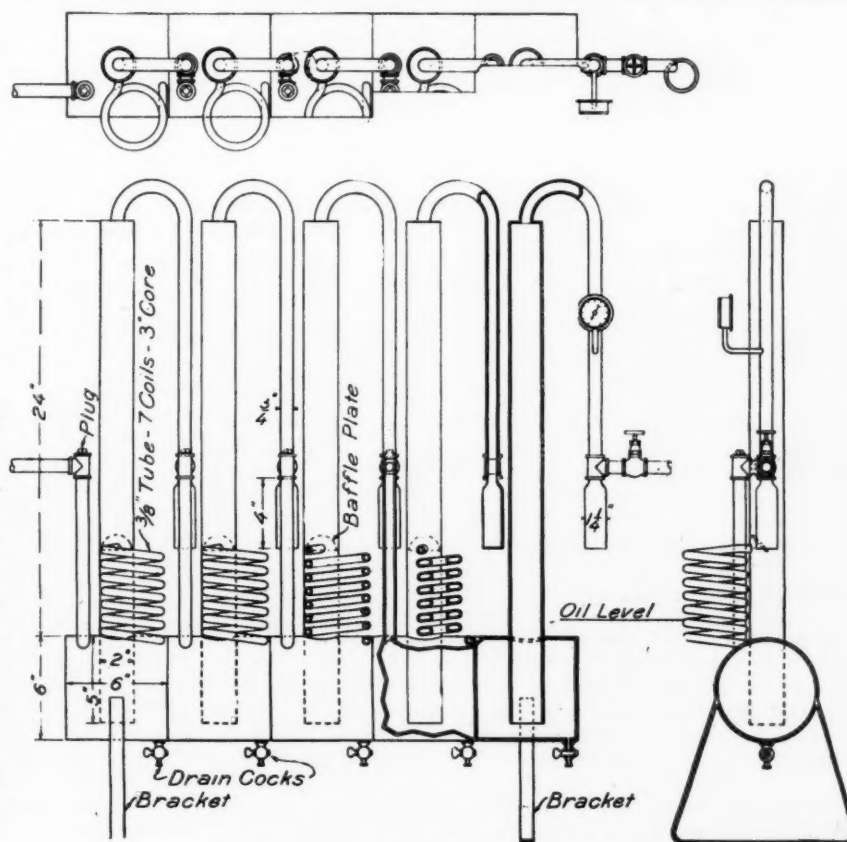


Fig. 1—Apparatus for making absorption test

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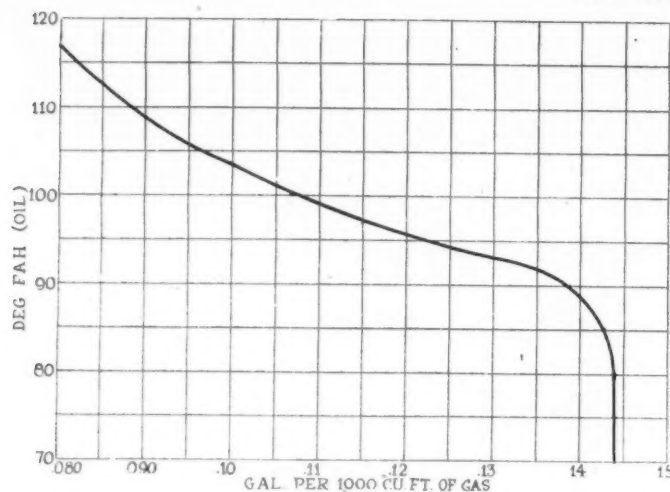


Fig. 2—Effect of temperature of absorbing oil

seal oil, or enough to bring the level of the oil about 2 in. above the top of the 6-in. casing and well above the coil inlet, is accurately measured and introduced into each compartment. The most important requisite for absorption media is high initial boiling point, in order that in the subsequent distillation a quantitative separation can be effected. The oil used in the tests described in this paper had the following physical properties:

Gravity .....	36.0° Be.
Initial boiling point .....	450° F.
Viscosity .....	51 Saybolt
Flash point (Pensky-Martens closed test) ..	271° F.
Fire test (Pensky-Martens open test) .....	307° F.

In most tests only the first three absorbers are used, but it may be expedient to fill the fourth compartment when examining rich gases at low pressures or when running a large volume of dry gas in paralleling a 12-hour, or day's, operation of an absorption plant to determine the extraction efficiency. The fifth division is not intended to be used as a container for oil but to serve as a separator or oil trap in case any oil is carried over from the preceding compartment. A meter capable of measuring from 1 to 1000 cu. ft. of gas accurately is connected to the discharge of the absorber.

The gas to be tested is allowed slowly to enter the apparatus with the discharge valve closed, and when pressure equilibrium with the gas to be examined is obtained, or when the desired pressure is attained, the discharge valve is opened enough to permit the desired rate of flow through the meter.

The gas entering the absorber bubbles up through the oil, the latter absorbing the gasoline. The function of the pipe coil is to provide a long and intimate contact between the oil and the gas as the gas passes through the absorber.

After the desired quantity of gas has passed through the absorber the supply is shut off and the pressure is released, through the needle discharge valve, allowing all the gas to flow through the meter. After the pressure has decreased to atmospheric pressure, all of the oil is withdrawn at the bottom of the casing and the oil from each compartment is accurately measured, 1000 c.c. of treated oil from each compartment being kept for distillation.

#### Distillation of Saturated Oil

Of the treated oil 400 c.c. is introduced into a 500-c.c. Engler distilling flask connected to a condenser made of ½-in. brass tubing and surrounded by cold (ice) water contained in a metal box. The flask is heated by direct fire, slowly at first, and the gasoline driven out of the oil is collected in a graduated cylinder. The flask is heated until the vapor reaches a temperature of 350° F., which usually requires 20 minutes. If the oil has a very high saturation, it is allowed to cool 20° or 30° and again raised to 350°. This procedure is followed until practically no more gasoline is driven over and collected from the condenser.

The extraction of gasoline by the oil will depend upon the rate of flow, gasoline content of the gas, volume of gas treated, pressure and the temperature of the absorbing oil. Optimum conditions as regards volumes of gas and rate of flow with gases at different pressures and gasoline content are given below.

Controlling factors in operation of test absorber:

Maximum rates of flow of gas Cu. ft. per hr.	Pressure Lb. per sq. in.
400	300
200	150
100	75
50	40
20	Atmospheric

#### Maximum Gas Capacity

Cu. ft. of gas	Gasoline, gal. per 1000 cu. ft.
800	.125
400	.250
200	.50
150	.75
100	1.00
66	1.50
50	2.00
35	3.00
25	4.00

The following data were obtained from a representative test made upon the intake gas at a compression plant in the Mid-Continent field:

#### TEST No. 2c

##### Intake Gas

Temperature of oil .....	94° F.
Pressure .....	204 lb.
Rate of flow .....	133 cu. ft. per hr.
Volume .....	302 cu. ft.

#### Compartments

	1st	2d	3d
Charge .....	2600 c.c.	2600	2600
Recovered .....	2700 c.c.	2660	2630
Gravity of oil .....	37.0° Be.	36.4	36.0
Distilled .....	400 c.c.	400	400
Initial C. B. ....	170° F.	185	398
Gasoline .....	19.5 c.c.	9.5	3.5
Total each .....	131.5 c.c.	63.2	23
	217.7 c.c. (78° Be. Gravity)		

Proportion extracted in each compartment .....	60.5 p.c.	29.0 p.c.	10.5 p.c.
Gasoline content .....	0.190 gal. per 1000 cu. ft.		

The gasoline content is calculated by using the following formula:

$$Q = \frac{1000}{G} \times \frac{C}{3785}$$

where Q is the gasoline content in gallons per 1000 cubic feet of gas, G is the volume (cubic feet) of gas treated and C is the total number of cubic centimeters of gasoline obtained from the treated absorption medium.

Much comment has been given as to the effect of pressure on the recovery of gasoline from natural gas by absorption methods. It has been stated that this is an objection to the use of a portable absorber in field testing, but it has been our experience that the effect of pressure can be entirely eliminated by adjusting the rate of flow of gas and the quantity of oil used in absorbers. In one test (data given) which was made at 17 lb. pressure with rich gas, the results checked up surprisingly close with the plant production (low gravity) plus the gasoline left in the residual gas.

#### TEST 11P

##### Intake Gas on High Compression

Pressure .....	17 lb.
Volume .....	149 cu. ft.
Temperature of oil .....	73° F. (av.)



	Compartment		
	1st	2d	3d
Charge .....	2600 c.c.	2600	2600
Recovered .....	3050 c.c.	2820	2650
Gravity (oil) .....	39.2° Be.	37.8	37.1
Initial B. P. ....	129° F.	138	162
Distilled .....	400 c.c.	400	400
Gasoline .....	48 c.c.	24.4	9.5
Total gasoline each .....	366 c.c.	172	63
Grand total .....	601 c.c.		
Proportion extracted in each compartment .....	60.9 p.c.	28.6 p.c.	10.5 p.c.
Gasoline content .....	1.07 gal per 1000 cu. ft.		

The temperature, above certain limits, of the absorbing oil has probably more effect on the efficiency of extraction than any other factor. In a series of tests of dry gas with all conditions constant, except the variable factor of temperature, a difference of 43 per cent in the volumetric recovery of gasoline for a gradient of 30° F. was obtained as is shown by the curve in Fig. 2. These changes took place between 90° F. and 120° F. and are undoubtedly due to the rapid increase in the partial vapor pressure of the gasoline fractions in the gas as the boiling points are reached. Probably no two gases will show the same results with the same variation in temperature, inasmuch as the characteristics of the gasoline hydrocarbons are distinctly not similar. The data from which this curve was plotted were obtained from a series of tests using a constant quantity of oil (2600 c.c. of oil in each of the first three compartments), a pressure of 130 pounds per square inch and a total volume of gas of 200 cubic feet which passed through the apparatus at the rate of 2 cu. ft. per min.

The test absorber and the method described in this paper are recommended in preference to the use of those scrubbers mentioned in other publications because they give more significant results when evaluating a gas with the idea of determining the feasibility of installing an absorption gasoline plant, or of ascertaining the efficiency of extraction at absorption or compression gasoline plants.

### Emulsion Lubrication of Cutting Tools

ACCORDING to J. A. De Leuw, writing in *American Machinist*, mineral oil does not keep the tool as cool as it should do because of its low specific heat and poor thermal efficiency. It does not always give satisfactory lubrication of the penetrating surfaces, possibly on account of its viscosity. An excessive amount of oil remains attached to the work and shavings.

Where cutting speeds are not too great, an animal oil, such as neats-foot, may be blended with the mineral oil to increase its lubricating qualities.

There are certain classes of work where the cooling of the tools is as important as the lubrication. An aqueous solution is the best lubricant for a hot tool, because it has the greatest specific heat. The point then is, can an aqueous lubricant be made which will actually lubricate the tool?

The lubricating efficiency of emulsions depends upon the action that the suspended oil particles can exert toward reducing the friction on the tool surfaces which come into contact with other metal. As the oil particles in suspension are carried mechanically into contact with the hot tool surfaces some of them must be interposed between the contact parts and thereby produce some lubricating action. The coarser oil particles will be prevented by their size from penetrating as far between the surfaces as the aqueous medium, but the finer particles, which are microscopic in size, will not filter out, but will follow the solution and perform efficient service.

If the compound is diluted in water by means of pressure, using special apparatus and proper temperatures, so that instantaneous solution can take place, then the solvent may be diluted with water without breaking up its combination with the oil, and a diluted solution is obtained which resembles in character the original compound.

The lubricating power of such a solution has been shown to be much greater than if the same material had been broken up into emulsions, and this is explained by the fact that an aqueous solution of oil is in actual existence and the water really has lubricating value.

## Natalite Fuel

Editor AUTOMOTIVE INDUSTRIES:

I HAVE before me your journal of July 18 and note on page 121 that you have an article on Natalite. I am pleased to see that your journal is interested in the new fuel, but I must correct certain misstatements in the article under review.

The article states in one paragraph "Although this fuel is not nearly so satisfactory as gasoline or kerosene due to carbonization of the engine," etc.

Now one of the main points in favor of Natalite is the fact that there is far less carbonization when using Natalite. This is a question that has been admitted by scientists and has been fully demonstrated in practice.

In another paragraph of the article it states: "In addition to carbonizing the engine, Natalite does not give as much power as gasoline and kerosene." There is not the slightest doubt that Natalite gives more power than petrol. I am inclosing herewith a few reports on Natalite by users who have done a few thousand miles on the new fuel, originals of which are in this office.

I inclose a little book on Natalite, which gives copies of the leading certificates and reports obtained on Natalite. The most important of these are:

The certificate, issued by the Royal Automobile Club of London. This certificate speaks for itself, as the R. A. C. is the leading institution of its kind and is recognized by the bulk of the automobile world. A few points in this certificate worthy of note are:

- (a) The engine was an old type.
- (b) The weight of the car and passengers was 32½ cwt.
- (c) The weather was very wet on the first day, so wet in fact that the cape hood had to be down all day.
- (d) The mileage worked out at 16.4 m.p.g.
- (e) The engine started easily from cold or when warm.
- (f) The valve caps and heads were found to be very clean after the trial.
- (g) The distance covered was 501¾ miles.

The outstanding report is that given by the late Professor Vivian B. Lewes. He was one of the leading men in Great Britain on all questions of fuel and was retained by the British Admiralty for this purpose. His report you will find very thorough and very convincing. You will notice on page 15 of the little book that the best result obtainable on "Pratts Perfection," with the carbureter set for the best results on petrol, was 16.9 hp. at 1300 r.p.m., whereas on page 16 you will notice that when the carbureter was set in favor of Natalite the horsepower developed at 1300 r.p.m. was 18.85.

The next report of importance is that contained in the supplement and carried out by Percy L. Weston of Queensland University.

My company is the parent company and own letters patent in most places of the civilized world. We disposed of the manufacturing rights for the Union of South Africa to the Natal Cane By-Products, Ltd., whose shareholders consist of the leading group of sugar growers in Natal. They imported the necessary machinery from France and have now been manufacturing Natalite motor fuel for some months. The capital of the company is £130,000, of which £15,000 is held in reserve. The output of the present factory is, roughly, 1,000,000 Imperial gallons per annum. The shortage of petrol has been so great and the new fuel has given such satisfaction that the demand for "Natalite" is many times the capacity of the factory. The local selling price is between 2/6 and 3/ per Imperial gallon, against petrol at 4/ to 4/6 per Imperial gallon.

Under existing Government regulations Natalite has to be colored with an aniline dye, hence the coloration of the carbureter mentioned in one of the reports.

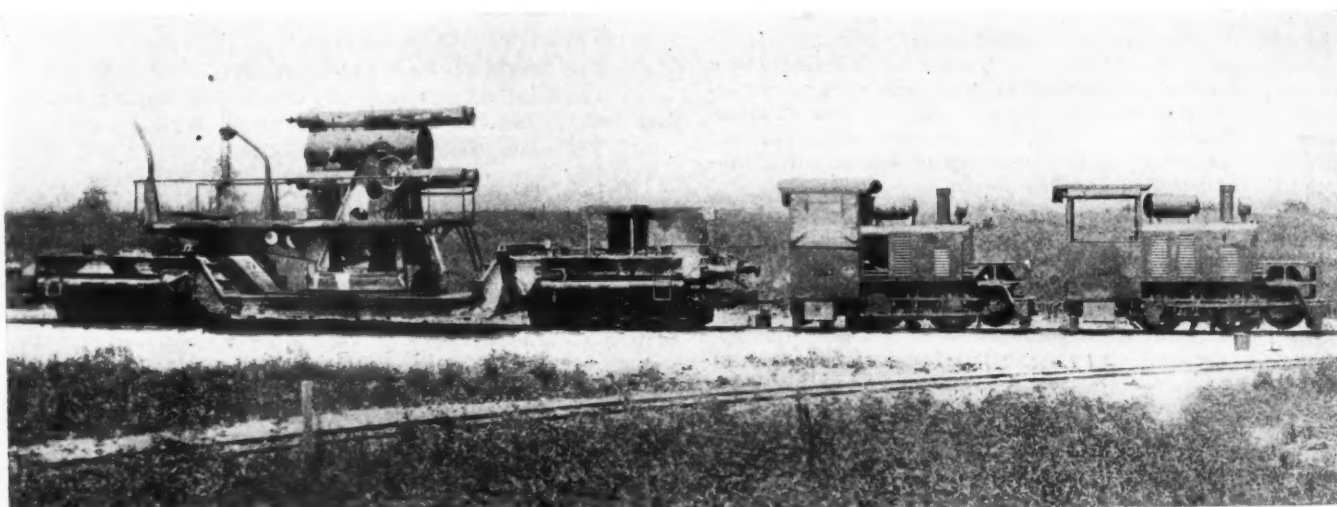
H. A. FINDLEY, Secretary.

[The copies of letters, etc., inclosed are too lengthy to permit of reproducing them here. They contain the statements quoted by Mr. Findley.—EDITOR.]

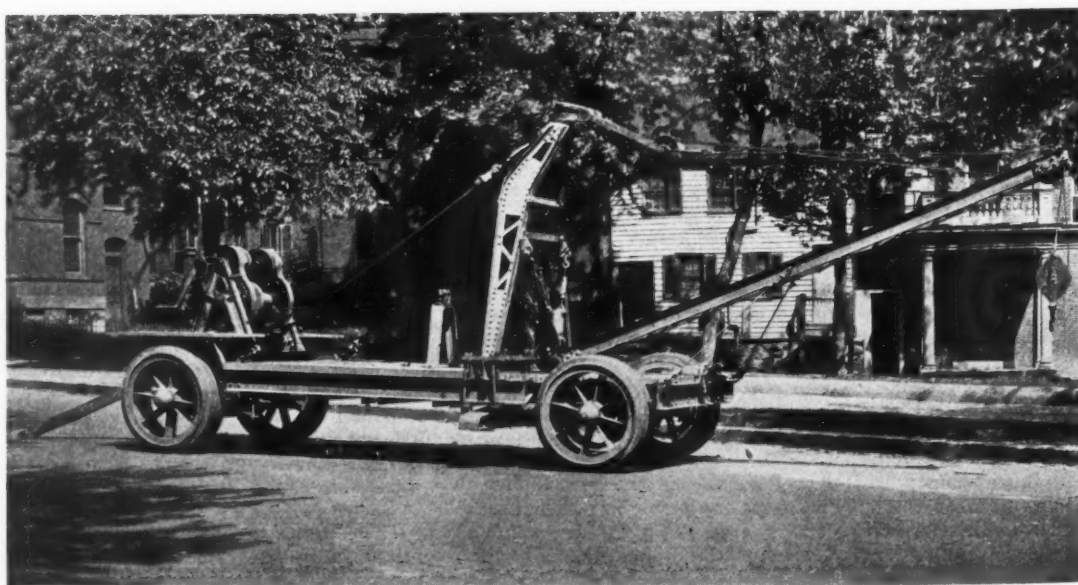


The Ford tank is equipped with two Ford engines. The gunner must sit in the small box from which the gun protrudes. He is huddled compactly in this space. The driver is granted but little more room and must drive the tractor by peering through the slots in the tower—which requires constant craning, as the seat is very low and only a tall man could look through the slots comfortably

## Army Automotive Equipment

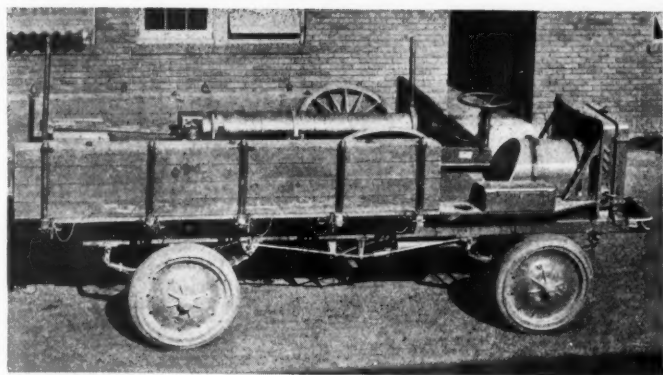


The standard gasoline electric locomotive used in France by the A. E. F. for moving large railway mounts to and at the front. This locomotive was used because it was considered desirable to eliminate the smoke which accompanies steam locomotives and which betrays them to the enemy

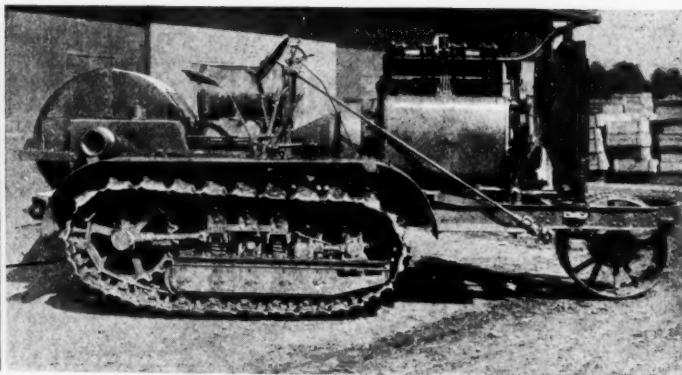


The 4-ton trailer equipped with a crane



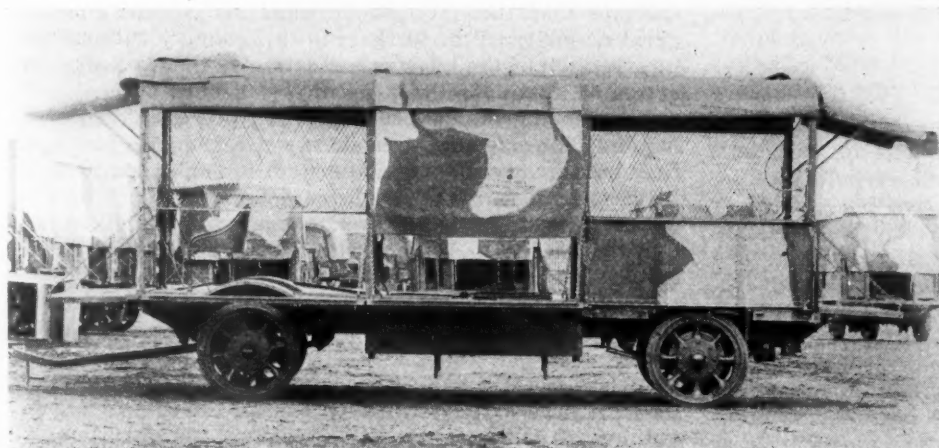
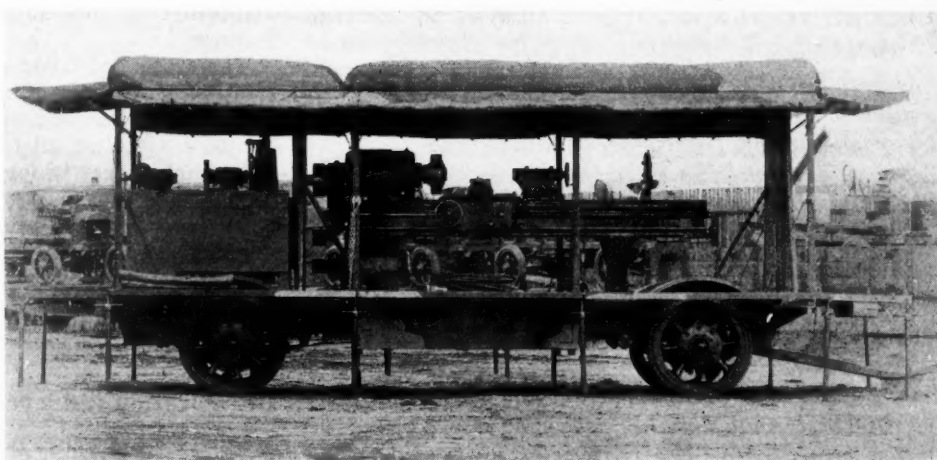


The trench mortar truck used by the A. E. F., with the mortar in the body

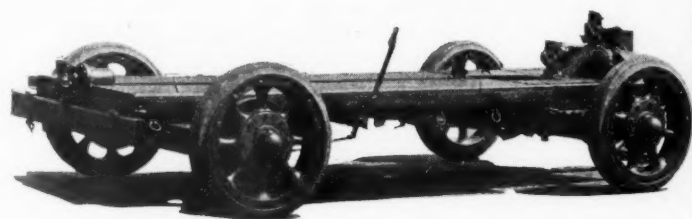


A close-up of the 15-ton artillery tractor—a 75-hp. machine produced by the Holt Co.

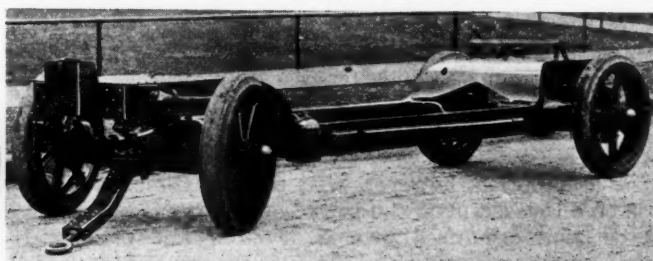
The lathe trailer. One of the units of the mobile repairshops. These repairshops comprise 12 trucks and trailers. As a rule they were hauled to convenient locations either along well traveled roads or near the front where they were parked compactly and conveniently and formed into repair depots



The parts and stockroom trailer—one of the units of the mobile repairshop



The 3-in. field gun trailer



The anti-aircraft gun trailer

# Wage Questions Must Be Handled from Inside the Industrial Unit

Here, Workers' and Employers' Interests Are Concerned with the Same Common Problems of Production and Environment—Profit-Sharing and Collective Agreement of Highest Importance

By Harry Tipper

*THERE are still some men who contend that the worker has no right to organize and that their employees have no right to join a union, and there are plenty of labor leaders who contend that the worker should be forced to organize and that nobody should work who is not a member of a union.*

*Both these conceptions are concerned with extending control in order to force the situation upon the opposite party. They are concerned with emphasizing the differences and minimizing the similarities. They create as much unrest as they claim to settle, because they are based upon unrest and turmoil and not upon agreement and peace.*

*In the last analysis this wage question must be handled from inside the industrial unit, where the workers' and employers' interests are concerned with the common problems of production and the common necessities of locality and social environment.*

**P**RACTICALLY all the discussions which have occurred in connection with questions of contracts, collective bargaining, and the major points of industrial relations, particularly collective bargaining or wage systems, have assumed the necessity for the establishment of contracts between organized labor bodies and organized groups of employers and have based their conclusions upon argument starting from this assumption.

Most of the discussion, of course, centers around the wage system and the question of collective bargaining because of the fact that, while the question of wages is not the only question involved in the troublesome problem of industrial relations, it is the point of contact at which all other reasons for dissatisfaction acquire sufficient momentum to become active.

The lack of incentive, the desire to escape from work, the tendency to float from one organization to the other, personal grievances, competitive disadvantages and other items which enter into the causes of industrial unrest, and which are frequently the primary cause, do not become active causes until they are associated with the wage question.

The assumption, however, that this question of wages must be discussed upon the premise of collective bargaining between organized groups of labor and organized groups of manufacturers is not justified by the evidence contained in the history of labor and industrial development and it confuses the issues by preventing an ex-

amination of this question of wages in a fundamental manner.

The organized labor bodies in this country represent so small a proportion of the total labor that the aims and purposes of such organizations cannot be regarded as the primary cause of all the strikes and other evidences of industrial unrest which are occurring from time to time in all fields of industry and in all parts of the country. It is true that the aims and purposes of the labor organizations, being the only concrete and definite representation of the desires of the workers of industry, have been seized upon by all large bodies of unorganized workers in the endeavor to improve their own working condition.

## Organization Influence Far-reaching

It is, furthermore, necessary to remember that the influence of the labor organization extends far beyond the confines of its own membership. At the same time the records of membership in the regular labor organizations indicate that the question of wages is decided for the great majority of the workers in this country without the intervention of the labor organization or the necessity for action of a manufacturers' group.

The fundamental difficulties, as all present systems of handling the wage question show, arise from the fact that they have grown up out of the tradition of free contracts between employer and employee determined only by the competition, the relative demand and supply and, consequently, the bargaining strength of the two parties involved.

From the standpoint of the employer, wages have been governed by necessity, and not considered from any human values. From the labor standpoint, wages have been governed by free competition, and they have been controlled almost directly in proportion to the collective bargaining strength developed in any one organization in any industry or at any particular time.

It is evident from an examination of the extent to which collective bargaining has grown, in the decision upon wages, that organization for the purpose of wages decision has gone far beyond the regularly organized labor bodies and has been used in connection with industries and bodies of workers where the regular labor organizations have little or no foothold.

## Fundamental of Free Contracts

The reason for this is obvious. A fundamental condition of free contract is that either party must be at liberty to withhold the commodity or service for which he is bargaining. There can be no advantage to the worker in withholding his individual service, for that in-



dividual service is quickly replaced and he secures only the disadvantage of losing the bargain altogether by such action.

On the other hand, with the growth of industrial establishments in size and capacity, one individual manufacturer can withhold the possibilities of employment from a large number of workers at the same time and amplify the disadvantages to the worker which result from the inability to decide upon a given basis for operation.

So long as wages are based upon the ability to bargain, it is to be expected that organization for the purpose of securing bargaining strength will continue and enlarge itself, and that there will be a definite attempt to coordinate such organizations with regularly constituted labor bodies, unless the other necessities of industrial organization are recognized by the employers in their industrial field.

### Aims of Labor Organization

The aims and purposes of the labor organization are the result of its fight for its existence and the extension of its power, and they are not concerned with the merits or demerits of the action; they are altogether concerned with the question of whether such action will increase the power of the labor body and place it in a better position to make that power felt when the necessity for bargaining arises.

Under this assumption of adjustment of wages, it is obvious that no thorough agreement can be reached at any time, but that all contracts must be in the nature of a temporary compromise, representing the present comparative strength of the two parties engaged in forcing the bargain. Whenever the strength of the two groups has changed in comparison, then the temporary terms, previously arranged, will inevitably go by the board in the clash of strength for a new adjustment of the bargain to the changed circumstances.

Several of the writers and industrial employers, who have attempted to suggest the development of other methods of adjusting wages, proceed upon the assumption that organized labor bodies and groups of manufacturers must control the newer collective arrangement as they have controlled the older collective bargaining, and they suggest standardization of wages, not in amount but through the different units of an industry and through joint standard boards functioning along the lines of those created in Great Britain and this country for war purposes.

Apparently these writers have not recognized the fact that the present organizations of labor, having been created and developed for the purpose of forcing bargains, and the present organization of employers, having been created for the purpose of defending the employers in such exhibitions of force, would be governed in their action upon joint committees by the constitution, the tradition and the precedent which make up their aims and purposes.

### No Hope in Such Standards

It is impossible to find any great hope in such standards, based as they are merely upon the prevention of strikes and the adjustment of troubles by arbitration, instead of being the result of examination of the causes of these troubles and their settlement by the adjustment of the causes.

Furthermore, no man who has studied carefully the tendency in labor and employer organizations, especially in the latter part of their development in other countries, can view with any equanimity the prospect of a strengthening of these divisions of industry in their opposition,

by the legalizing of joint committees appointed from these bodies and the power to compel the settlement of industrial questions through these means.

There is no will o' the wisp more alluring to the employer of labor than the compulsory arbitration suggested by these writers and attempted in some countries. A superficial examination of the work of such boards for a few years lends an appearance of success to the proposition.

Inasmuch as the organizations themselves are concerned with the use of force in obtaining the advantage in a bargain and not with securing co-operation in the attainment of a full agreement, the attempt at compulsory arbitration would simply transfer the strength from the semi-public atmosphere to the political atmosphere. There would be an endeavor to secure through politics what has been removed from the sphere of private action.

The effect of the labor organization in the collective bargaining system, through the history of its work up to the present, has been to increase the class consciousness of workers in various industries. In some countries it has solidified the class consciousness in a sufficient measure to make it formidable.

The grave danger in industrial relations, the gravest danger of all, is the increasing solidarity of class and the increasing divisions between classes emphasized by this form of organization.

An attempt to standardize the wage system by extending this method of collective bargaining until it carries over the whole surface of industry, headed by joint committees of workers and employers, legalized under a compulsory arbitration system, would but increase the class division and class solidarity which has so frequently been noted as the great danger.

In Great Britain to-day the strength of organized labor in the political life of the country is something which must be reckoned with by every thinking man and which finds its expression at every turn in connection with the legislative outlook. It is not in the direction of an attempt to solve the wage question by general systems of collective bargaining and arbitration that industrial satisfaction and efficiency lie.

### Must Treat Industrial Unit as a Whole

Again it must be emphasized that the industrial unit is an organization and not a division of organizations, and no suggested method can bring any hope of prospective solution which does not treat the organization of the industrial unit as a whole, and particularly no solution can be expected by any system which emphasizes the division of interest that has been brought into the question by the attempt of both sides to gain more strength in the final action of collective bargaining upon the wage question.

The speeches of the labor leaders within the last few weeks indicate that the aims and purposes of the labor organization have not changed any but are still concerned with the control of the working conditions and not with any agreement with the employers as to those working conditions, while the statements publicly made by some of the employers and those representing employers' organizations have indicated the intention of the employers to retain control of the working conditions and not to give up any part of that control in the endeavor to arrive at an agreement.

For these reasons the profit-sharing systems within the organization and other systems of collective agreement upon wages inside the unit are of the highest importance to the manufacturer and should be considered with the utmost patience.

# Austro-Daimler 200-Hp. Aircraft Engine

## PART II

### Details of Crankcase Construction—Ignition, Fuel and Cooling Systems—Results of Power and Endurance Tests—Analysis of Weights and Materials of Construction

**T**HE lower half of the crank-chamber is complicated in design, and excessively heavy, weighing 73.5 lb., complete with false bottoms.

The walls are 6 mm. thick and are strengthened inside and out by ribs spaced 130 mm. apart.

A perforated plate of galvanized sheet steel is screwed onto a flange cast about half-way down the chamber. This plate has shallow oil sumps formed on it at each end and a large hole cut in it in the center; other holes, 25 mm. in diameter, are pierced in it in various places. Over this bottom is screwed a sheet of finely perforated steel, covered on the un-

derside with very fine wire gauze. Below the filter plate the bottom of the base-chamber slopes sharply to the center portion, which is flat and has a small sump bolted on underneath it. Cooling ribs are cast in the two sloping portions, both inside and out; the sides of the base-chamber are carried down 40 mm. below the bottom and a strip of sheet aluminum is screwed on to their lower edge, thus forming an air chamber along the whole underside of the engine. The aluminum plate has three air ports covered with wire gauze at each end. According to a report these ports are fitted with a vaned shutter.

The main air supply for the carburetor is taken from this false bottom through a passage cast in the side of the crank-chamber. The purpose of the false bottom is to cool the lubricating oil and warm the incoming air.

The lubrication system of this engine is on the wet sump principle, having one large pump to keep the main oil in circulation and a smaller sump to supply a small charge of fresh oil to the system at each pump stroke.

In this engine the main pump sucks oil from the sump, which is approximately of 7 gal. capacity, and delivers it under pressure to the main journal bearings.

#### Oil Pump and Lubrication System

The small pump supplies the camshaft with fresh oil taken from the tank cast in the top half of the crankcase. The main oil pump consists of a steel plunger 40 mm. in diameter, working in a cast iron barrel. This plunger is hollow and has another plunger or ram, 7 mm. in diameter, fitted inside it. Both the barrel of the pump and the small plunger remain stationary, while the large plunger is rotated by means of a bronze worm wheel, which floats on a square formed on the plunger. The worm wheel is driven from the crankshaft by a worm cut on a small inclined shaft. Besides rotating, the plunger is made to reciprocate by means of a scroll cam machined in the plunger, which works against a hardened steel roller fixed into the pump barrel, and thus transmits the reciprocating motion to the plunger, the end of which is plugged and forms the piston of the main pump.

The small ram fitted inside is also hollow and works on the same principle, though in this case the barrel moves while the ram remains stationary. A port cut in the side of this small plunger is put in communication alternately with the supply pipe from the tank and the delivery pipe to the camshaft, by means of an oil way drilled radially in the main plunger. From the main oil pump the oil is forced along a delivery pipe to the center of the engine, where it feeds the main oil lead running beneath the crankshaft and connected to each of the journals by vertical branch pipes.

The crankshaft is bored and plugged in the usual manner and conveys oil from the journals to the crankpins, whence the oil is forced up the small pipes attached to the connecting-rods into the little-end bearings.

The delivery pipe from the small pump to the camshaft is taken up the front end of the engine and runs along outside the camshaft casing, being connected to the oil ways drilled in the cover plates by six inclined channels formed in the cover plates.

From this central oil lead in the cover plates the oil is conveyed to the camshaft bearings by the vertical holes drilled in the ends of the cover plates, and to the rocker arms by

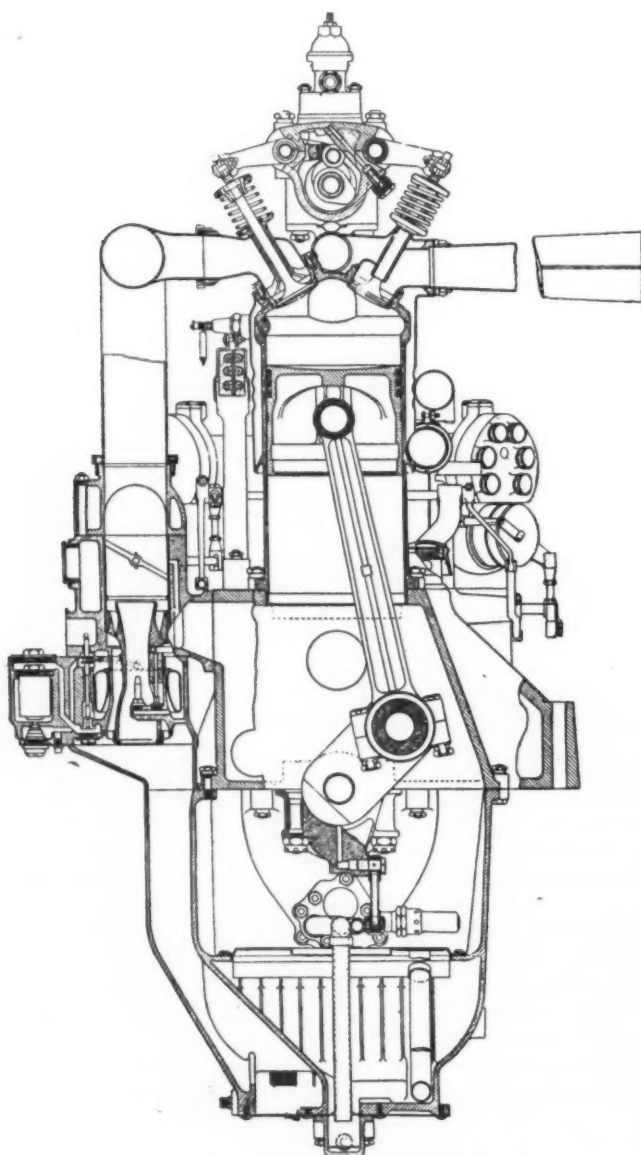
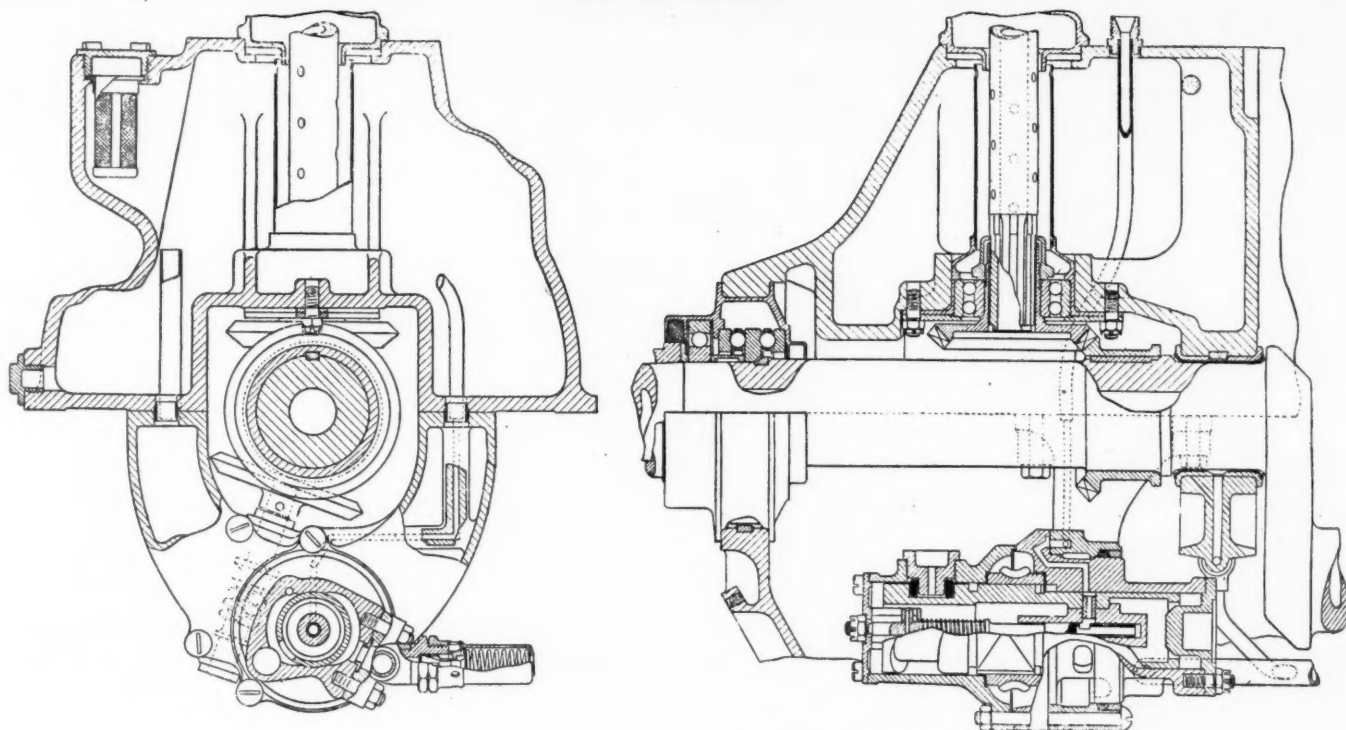


Fig. 11—Cross section of engine





Figs. 12 and 13—Vertical shaft drive and thrust bearings

short cross channels, which deliver the oil into grooves milled in the rocker arms, whence it finds its way to the journals of the hollow rocker spindles and their bearings, and also to the cam rollers and cams.

The camshaft is always kept half full of oil, and provision is made for filling up before starting by three holes fitted with threaded plugs, which are placed in the top of the cover plates.

From the camshaft casing the oil overflows through two grooves formed in the side of the front camshaft bearing and thence finds its way to the sump down the vertical spindle casing, lubricating the vertical spindle bearings and gears on its way.

The oil sump is exceptionally deep and is fed from the sheet steel false bottom by three pipes, one from each end and one from the center.

#### Ignition

The two Bosch Z.H.6 type magnetos are driven by bevel gears off the bottom end of the camshaft driving spindle at the front of the engine. The magnetos are mounted on aluminum brackets which are bolted to the top face of the crank chamber, which forms an extension over the auxiliary oil tank.

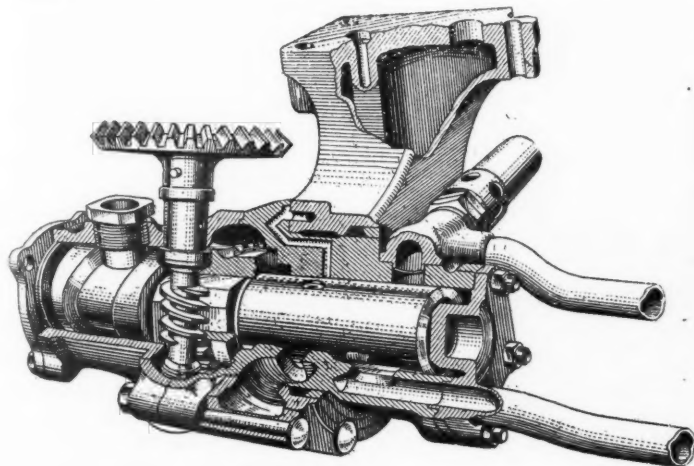


Fig. 14—Combined main and make-up oil pump

As will be noticed in the illustrations of the engine, the magnetos are placed diagonally, each magneto being driven at an angle of 52 deg. to the crankshaft axis, in a horizontal plane.

Two Bosch three-point spark plugs are fitted to each cylinder on the same side of the engine, being screwed into the combustion heads just below each inlet valve; each magneto, of course, serves one plug of each cylinder. The magneto controls are interlinked with the throttle control, so that when the engine is throttled down the ignition is automatically retarded. The order of firing is as follows: Propeller, 1, 5, 3, 6, 2, 4.

As shown in the illustration of the induction side view of the engine, Fig. 1, all the high tension leads from the magnetos are carried in a particularly neat form of cable carrier, which is made of red sheet fibre and is carried on cast aluminum brackets attached to the top of the crankcase.

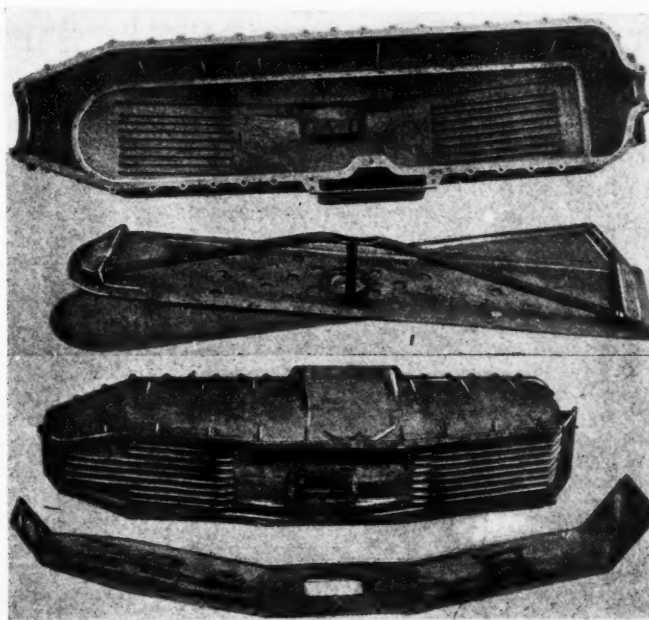


Fig. 15—Crankcase sump

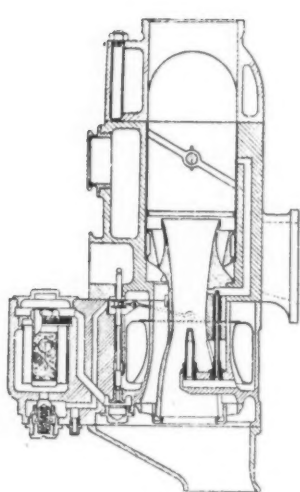


Fig. 16—Two sectional views of the carburetor

The large duplex carburetor is placed on the left side of the engine, and supplies the mixture through two separate galvanized steel induction manifolds; each manifold feeds three cylinders and is lagged with asbestos. The carburetor is built up in three sections. The bottom section—which is made of gun-metal—contains the two float chambers and the four jets. A common filter chamber fitted with the usual gauze strainer is cast on the front of this portion. The center portion of the carburetor—which is made of aluminum—contains the butterfly throttles and the upper portion of the choke tubes.

A large air chamber, cast round the throttle barrels, is used as the outlet for hot air from the crankcase, and thus helps to warm the mixture. The top portion of the carburetor consists of a cast aluminum chamber, in which the supply for the two carburetors is united, thus insuring an equal supply to each manifold. This chamber has a waterjacket cast round it, which is connected to the main water circulation system by a pipe at each end.

The annular float chambers encircle the choke tubes. Two jets are fitted in each carburetor, the capacity of the main jet being 35 cc. per minute, and that of the pilot jets 5.8 cc. per minute.

The filter is fitted with a pressure release valve which discharges into a small chamber below the filter, where it unites with the overflow from the float chambers.

The air supply to the carburetors is taken from the false bottom, through a passage cast in the side of the crank chamber. An extra air valve is fitted round the choke tubes.

In the Austrian "Berg" biplane scouts, fitted with these Austro-Daimler engines, the main fuel tank is under pressure and is situated at the bottom of the fuselage, behind the en-

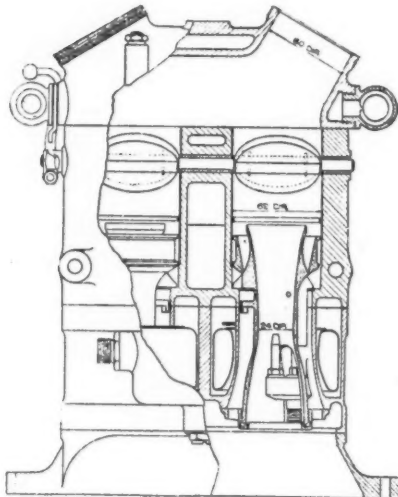


Fig. 17—Camshaft and air pump

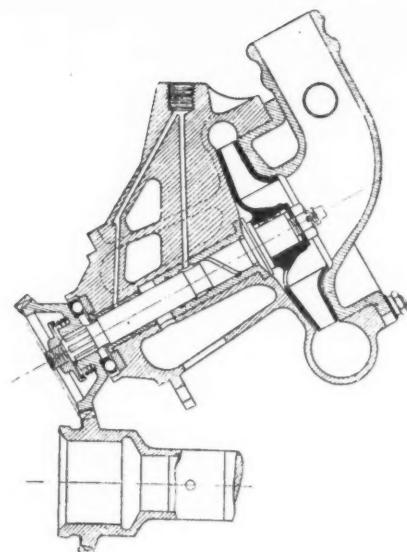


Fig. 18—Section through water pump

gine. A small gravity tank holding 3½ gal. is also fitted as an emergency fuel tank, just behind the engine in the upper part of the fuselage, and the total air endurance according to report is given at 2½ hr. at 1000 ft.

#### Air Pump

The air pump for the fuel tank pressure is of the spring-loaded plunger type, and is operated by a separate cam on the camshaft between the two rear cylinders. As shown in the sectional arrangement drawing of the compression release gear, it is mounted on the cover of the cast aluminum camshaft casing.

A hand pressure pump is also fitted in the machine.

#### Water Pump

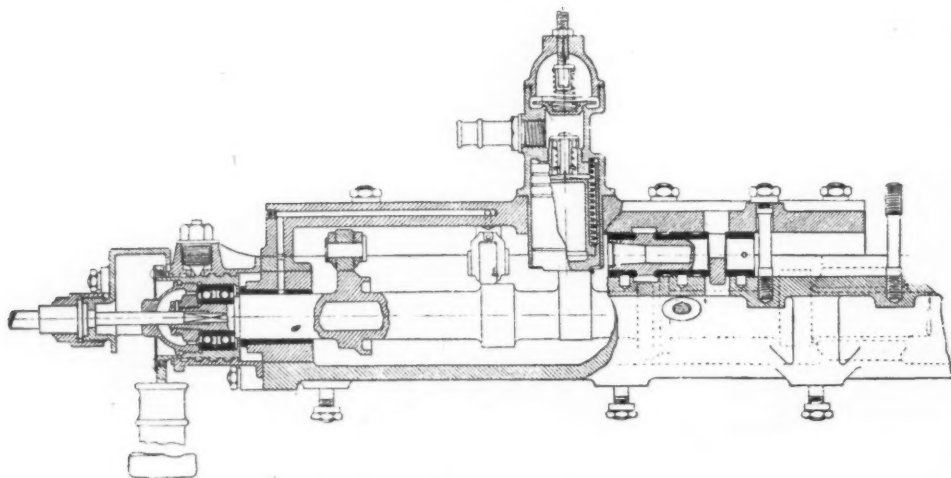
In Fig. 18 is given a sectional view of the complete water pump. This is of the centrifugal type, and as shown in the views of the engine is driven directly off the rear end of the crankshaft by a bevel gear which is integral with a sleeve forming an extension shaft. This is attached to the rear end of the crankshaft, and also drives the gun interrupter gear through a worm gear on a transverse shaft.

The water pump spindle is inclined at an angle of 30 deg. to the crankshaft and runs in phosphor bronze bearings. The driving bevel gear floats on the end of the pump spindle, and is fitted with a large diameter thrust ball race and retaining spring, which, being at the bottom end of the spindle, are as far away as possible from the rotor of the water pump. Both the pump spindle bearings are well lubricated, through two drilled holes in the pump body and oil grooves cut in the spindle bearings, by a large self-acting grease lubricator which is screwed into the cast aluminum water-pump body.

The pump rotor is 112 mm. in diameter and is formed with six vanes of the usual Mercedes type. The rotor is keyed to the spindle and secured by a gun-metal nut and washer.

A conically faced shoulder is machined on the pump spindle directly beneath the rotor. The shoulder beds into the beveled face of the bronze bearing, forming an efficient water joint. The water pump, although somewhat heavy in its construction, is well designed and is very accessible. The diameter of the intake passage through the cover is 36 mm., and the diameter of the delivery is also 36 mm.

A "V" type honeycomb radiator is used with this engine, and is mounted at the front of the engine, directly behind the propeller.





The capacity of the radiator is approximately 4 gal., and a small barrel-shaped condenser, 4 in. in diameter and 5 in. long, is provided on the top of the radiator, apparently to prevent boiling water from escaping and blowing back. No louvres or blind are fitted to prevent over-cooling.

From the bottom of the radiator water is circulated through the steel pipe to the inlet of the water pump and is delivered into the bottom of each of the cylinder waterjackets. These are coupled together in the usual way by rubber joint rings and clips, both at the bottom of the waterjackets and in the water passages above the valves in the cylinder heads. The construction of these joint rings is interesting, consisting of beveled rubber rings, reinforced in the center with a steel spring ring. The rubber joint rings are expanded into the outside of the conical faces of the steel water connections on the cylinders by the halves of a split aluminum ring, which are clamped together by a band clip of ordinary design. From the results and appearance of the engine during tests these water joints are very efficient. Circulating through the cylinder waterjackets, the water passes to the top of the radiator through two passages cast in the front end of the aluminum camshaft casing. These water passages encircle the camshaft just behind the driving bevel gears.

#### Revolution Indicators

A flexible drive for the engine speed indicator is driven directly off the rear end of the camshaft in a small extension chamber, and some form of revolution indicator was apparently mounted in the center of the "V" radiator. Unfortunately the instrument is missing, but a portion of the driving mechanism is shown in the general arrangement drawing, from which it will be seen that the gear employs a small diameter worm mounted about half-way up the vertical driving shaft. This engages with a worm pinion which drives a grip-gear pinion at a speed ratio of approximately 1:100.

#### Wireless Generator

A flange is machined on the rear extension of the crankshaft to take a belt driving pulley for the wireless dynamo. This pulley is probably of the standard friction clutch type used on all enemy engines.

No exhaust manifold or muffler is provided, but a separate short exhaust pipe about 12 in. long of streamline section extends from each cylinder.

#### Conclusions

The design of this new type Austro-Daimler engine, as set out in the foregoing detailed description, and the following data and test results, shows a careful study of details.

Both in its general lay-out and in most of its details of construction this engine undoubtedly possesses more originality in design than the majority of enemy engines up to the present time.

The design of the lubrication and oil-cooling system has evidently been carefully considered, as have also the carbureter and induction systems.

The new type of scroll cam oil pump is interesting, but in its present form is excessively heavy. This type of oil pump, however, it is interesting to note, is now used on the new 270 hp. Bassé-Selve engines. In these engines the oil pump works on exactly the same principle, but is duplex and is relatively much lighter, the body of the pump being made of cast aluminum instead of cast iron.

#### R. A. E. Calibration and Endurance Test Report

The 200 hp. Austro-Daimler engine was coupled to a Heenan & Froude dynamometer, and run for the usual calibration and one-hour endurance tests. Power, throttle, and consumption curves are given in Fig. 19.

##### Calibration Results

R.p.m.	1300	1400	1500	1600
B.hp.	186	200	212	222
Brake m.e.p.	123.5	123.3	122	119.7
Fuel consump. in U. S. gal./b.hp./hour	.086	.085	.0852	.0854

The engine was submitted to an endurance test of one

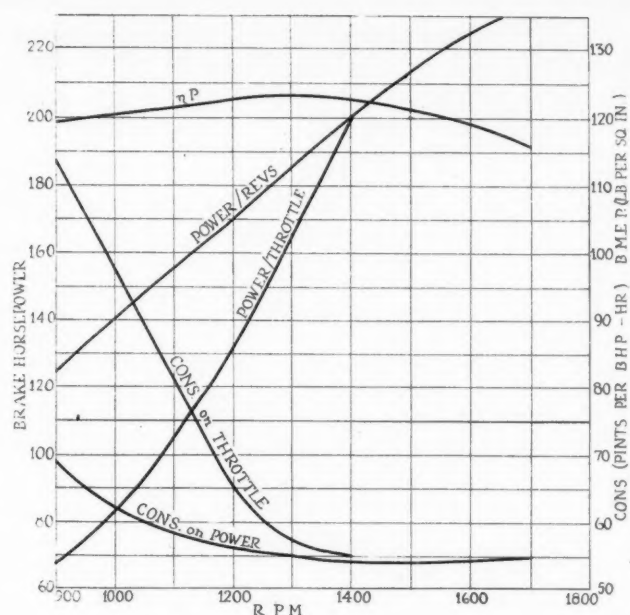


Fig. 19—Performance curves

hour's duration at normal revolutions, i. e., 1400 r.p.m., with the following results:

Average output	202 b.hp.
Average speed	1400 r.p.m.
Fuel consumption per hour	16.8 U. S. gal.
Fuel consumption b.hp. hour	0.665 U. S. pints/b.hp./hr.
Oil consumption per hour	8.4 U. S. pints.
Oil pressure	5 lb./sq. in.
Oil temperature	50 deg. C.
Water temperature (inlet)	54.5 deg. C.
Water temperature (outlet)	60 deg. C.
Total duration of tests	10 hr. 25 min.
Complete weight of engine	728.5 lb. dry.

##### Weight per B.hp.

At 1300 r.p.m.	= 3.81 lb. per B.hp.
1400 r.p.m.	= 3.64 lb. per B.hp.
1500 r.p.m.	= 3.43 lb. per B.hp.
1600 r.p.m.	= 3.28 lb. per B.hp.

##### Running During One Hour Endurance Test

Very steady between 700 and 1700 r.p.m.  
At 500 r.p.m. vibration was bad, and below this speed running was generally unsteady.

##### Distribution

Very good.

##### Cleanliness

Throughout the test the engine kept remarkably clean. No trace of oil or water leakage was observed.

##### Troubles Experienced on Test

The K.L.G. spark plugs fitted for the test gave trouble by shorting internally.

The valve tappets required to be readjusted during the test.

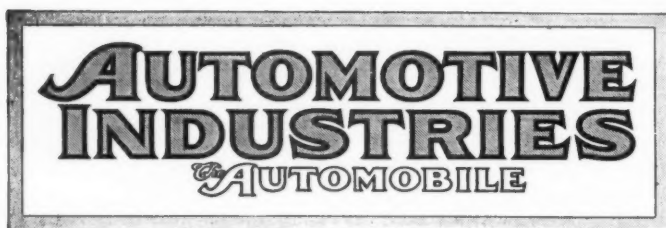
##### Test of Water Pump

Speed of the water pump spindle = 1.894:1 crankshaft revolution.

The delivery of the water pump under varying pressures has been made the subject of a separate test. The pump was coupled to an electric motor and run with the following results:

R.P.M.	Pressure	Delivery
1800	2 lb. sq. in.	50.5 U. S. gal. per min.
1800	4 lb. sq. in.	44 U. S. gal. per min.
1800	6 lb. sq. in.	36 U. S. gal. per min.

The weight of the complete water pump = 7.6 lb.  
(To be continued)



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## Engine Bearing Proportions

**A**LTHOUGH automobile design, and especially engine design, has attained to a high state of perfection, there is no doubt that further progress is possible in many details. But the more nearly perfect the design the more difficult it becomes to make improvements. It was pointed out at a recent meeting of the S. A. E. Buffalo Section that the best results cannot be achieved by measuring up existing engines and striking an average. While this method is a fairly safe one and may commend itself to the designer with little experience, no progress can be hoped for from it.

There are just two methods by which present design can be rationally improved. The first is to carefully observe the behavior of engines in practice or study reports to the service department, noting what parts give most trouble and considering the causes of these troubles. The other method consists in studying the forces on the different parts of the engine analytically and proportioning the

parts in accordance with the loads they will have to bear.

An interesting illustration of the way in which engine design is gradually being improved through observation of the frequency of different repairs and through analytical investigation is afforded by the central main bearing of a four-cylinder crankshaft.

In the earlier four-cylinder engines this bearing was generally made short, owing—in one sense—to lack of space. The designer would settle upon his cylinder center distance in accordance with the dimensions of cylinder bore, depth of waterjacket and wall thicknesses, placing the cylinders as close together as possible, and this would unnecessarily leave little room for the central bearing. The rear bearing was made long because it had to support the flywheel, and the forward bearing generally also was liberally proportioned because there was plenty of space in front. Anything added to the length of the central bearing meant that much added to the length of the crankcase and the whole engine.

It was observed, however, in practice by manufacturers having numerous four-cylinder engines in service that the central bearing invariably required renewal first. A little reflection readily suggested the reason for this. The greater part of the load on any crankpin is taken by the main bearing adjacent to that crankpin, and as there are two crankpins adjacent to the central bearing the latter supports the pressure of the explosion twice to once on each of the other bearings. This determines the distribution of bearing loads at low speeds.

At high speeds the inertia of the reciprocating parts is the most important of the factors determining bearing loads. Now, adjacent to the central bearing there are two sets of reciprocating parts which move in unison, and their inertia forces add together. The same applies to centrifugal forces, and the result is that the mean or average load during the complete cycle is much greater on the central than on either the front or rear bearing. In a four-cylinder engine the weight of the flywheel is small as compared with the inertia and centrifugal forces at high speed, and it is a rather curious fact that while designers have always been very conscientious in providing in the bearings for this weight they have paid little or no attention to the inertia and centrifugal forces.

An analysis of main bearing pressures on four-cylinder crankshafts has been made by Otto M. Burkhardt and presented in a paper read before the S. A. E. Buffalo Section. Mr. Burkhardt's figures show that under full load at normal speed the average bearing load on the central bearing is 70 per cent greater than the load on either end bearing, and while idling at high speed the average load on the central bearing is even twice as great as that on either end bearing. In determining the relation between the bearing lengths it should be borne in mind that the engine works at nearly full load only part of the time. Account can be taken of this by giving different "weights" to the relative load factors, these weights depending upon the proportions of the time the engine runs under these load conditions.



## Wishing Is Not Winning

"IF the United States is to have any foreign trade, she has got to get busy."

In just so many words has the situation been sized up by an American business man, a returned traveler who is a keen observer, whose experience gives weight to his opinions and who is accustomed to look far into the future.

To-day, the markets of the world are open to us as they never were open before. Our neighbors across the seas need our products as they never needed them before.

But "America has got to look out for herself."

The industrial plants of our international trade rivals have been far more disrupted than have those of America. Production of peace-time essentials has been cut to the bone. The resources of our Allies have been centered on the production of the sinews of war to a far greater extent than have those of America. Our Allies must overcome the handicap of four years of war as against our one.

But they have also the advantages of that four years—they have learned the lesson of quantity production, which under normal conditions might have taken much longer to learn. They are living in the midst of the realization that foreign trade must be developed to the utmost to help pay their war indebtedness. And they undoubtedly will grasp the

opportunity which the learning of the lesson has put within their reach.

"America should go quickly after the markets of the world."

America has never been in a better position to enter world trade on that comprehensive scale the world now wants. Our factories have been marvelously expanded. They have learned to diversify their lines. They have been compelled to supply demands which hitherto have been supplied from abroad. They have been thrown upon their own resources to produce, not alone for ourselves, but for our Allies as well, hundreds of products which hitherto have come from our enemies.

And last but not least we have the ships. Already we have seen reductions of one-fourth to one-third in existing ocean freights to South America, Australia, and Africa—a reduction which has been made to induce American shippers to take advantage of the tonnage now available.

Wishing is not winning. "Foreign countries are going after world trade in a way that will make America sit up and take notice." Nothing but an aggressive policy based upon a well-formulated plan, will give to American industry that share of world trade which is its just due—and which it must have.

## Prospects of Civil Air Transport

DURING the past two months a number of forecasts of the future of commercial aeronautics have appeared in the press from men at the head of aircraft manufacturing corporations, aero clubs, etc. Most of these have taken a rather roseate view of the prospects of this new means of travel, though practically all admit that the immediate future is beset with difficulties.

In England, where forced development of the aircraft industry began about 3 years before it did here, and where the industry has grown to an enormous size, anxiety concerning its fate at the end of the war began to be felt more than a year ago. In order to pave the way for commercial applications of aircraft as soon after the war as possible, a Civil Aerial Transport Committee was formed to report to the Air Board with regard to the steps which should be taken.

This committee has recently made a report. Unfortunately considerable material has been deleted from the published text; what remains, however, makes quite interesting reading. The problem is dealt with under five headings, namely, Municipal Control and Legislation, Technical and Practical Questions as to the Possibilities of Performance of Aircraft, and as to the Requirements of Aerial Services, Business Questions Relating to the Possibilities of the Aircraft Manufacturing Industry After the War, Questions of Labor and Problems of Scientific Research and the Education of Expert Designers, Engineers and Pilots.

The tone of the report is a most reserved one and

quite in contrast to some of the optimistic predictions made by others recently. It is pointed out that the conditions of success are radically different in developed and undeveloped countries respectively, as in the former aerial transport must compete with existing means of transport and communication, while in the latter it would practically be without competition. The committee holds the view that while carriage of mails, passengers and certain kinds of light, valuable merchandise by airplane will be successfully developed after the war, the amount of business in sight in these lines is altogether inadequate to keep the highly developed industry going, and state aid is advocated, in view of the fact that the maintenance of the aircraft industry's productive capacity is considered essential to the safety of the Empire. As to what form the assistance should take, whether the Government should give assistance directly to private enterprises or should assume exclusive ownership or participate in the ownership of air transport lines, the committee does not feel prepared to say.

From comments in the British aircraft press it appears that the aircraft industry has been somewhat disappointed in the report. While it is urged that "The British Empire should not be allowed to lag behind other nations in preparing for civil aerial transport," the recommendations made are all limited to further investigation and preliminary action, so that the prospect of immediate outlets for the products of the aircraft industry is not visibly improved by the report.

# □ Latest News of the

## Sales for Export Not Taxable

But Domestic Sales, Subsequently Exported at Instance of Buyer, Pay Tax

NEW YORK, Jan. 6—Passenger cars and trucks sold by the manufacturer on a bona fide export order are not taxable under the provisions of the present War Revenue Bill, according to a ruling which the National Automobile Chamber has just received from the Treasury Department. But where a car or truck is sold to a domestic concern and subsequently exported at the instance of the buyer the tax is collectable.

The ruling makes plain that a sale to a concern doing business in the United States is a domestic sale unless the terms of the original order or contract of sale show that the seller is to export the vehicle, or that he is to make such delivery of it as will result in its exportation; in the latter case the tax is not to be collected. Where a car or truck is sold by a manufacturer, and subsequently exported, the manufacturer must pay the tax. To claim exemption from payment of the tax, the person making the claim must show that he is the exporter.

The Treasury Department originally ruled that cars and trucks may normally be exported in the following ways:

- 1—They may be shipped by the manufacturer to an agent in a foreign country and after reaching there may be sold by the agent.
- 2—They may be shipped by the manufacturer to a foreign purchaser to fill orders received by an agent in a foreign country.
- 3—They may be shipped by the manufacturer to a foreign purchaser to fill orders received by the manufacturer in the United States.
- 4—They may be shipped by the manufacturer to a foreign purchaser to fill orders solicited by mail and received by mail from the foreign purchaser.

Examples of sales by a manufacturer which are taxable, notwithstanding ultimate exportation of the articles sold, are:

- 1—A sale to a dealer in the United States, effected by compliance with his shipping instructions to export, given subsequent to the contract of sale which did not require export shipment.
- 2—A sale to an export commission house in the United States, which is effected by a shipment consigned to the commission house at a domestic port which is followed by immediate exportation by the commission house to a foreign buyer, in whose behalf it made the purchase.
- 3—A sale to a corporation in the United States which immediately exports to a foreign concern of which it is a subsidiary.
- 4—A sale to a member of a foreign partnership who conducts a buying business in the United States for his firm and exports the articles bought. In these cases the application of the taxes is not affected by a provision in the contract of sale requiring the buyer to use or dispose of the article sold only in some foreign country (T. D. 2781).

The new revenue bill, if enacted in its present form, gives authority to the Secretary of the Treasury to make provision for the exemption from tax of all cars that are ultimately exported.

## Trego Motors to Make Passenger Car Engine

NEW HAVEN, Jan. 8—The Trego Motors Corp., of which Frank Trego, formerly chief engineer of the Packard Motor Car Co., is head, is shortly to place on the market a high class six-cylinder engine designed for passenger car use. The Trego company was formed about a year ago for the production of Liberty aircraft engines, but in July of this year transferred its manufacturing activities from aircraft to ordnance work. It is understood that the new engine will be of the L-head type designed for maximum efficiency. No particulars regarding the design or construction have been made public.

## Four Army Planes Reach Atlantic

NEW YORK, Jan. 8—The four army airplanes which left San Diego Dec. 4 arrived at Hazelhurst Field, Mineola, L. I., last night, having covered the 3800 miles in 55 hours of actual flying time during the 34 days consumed in making the trip. The trip was started originally to map an aerial postal route between San Diego and El Paso. Plans were later changed to take the four planes completely across the continent.

## Average 172 M.P.H. in Martin Bomber

CLEVELAND, Jan. 8—In the first bombing plane turned out by the Glenn L. Martin factory, Pilot Eric Springer and one passenger flew the 215 miles between Dayton and this city in 1 hr. and 15 min., averaging 172 m.p.h. The machine is one of a new type, weighing 2500 lb., and being equipped with two Liberty engines.

## Beecroft Due Back Jan. 23

LONDON, ENGLAND, Jan. 7—Special Cable—David Beecroft, directing editor of the Class Journal Co., who has been in Europe since Oct. 26 as a member of the party of business paper representatives who have been the guests of the British Government, will sail for New York on the Adriatic on Jan. 15. The steamer is due in New York Jan. 23 or 24. All of the party returned on Jan. 2 except Mr. Beecroft, who remained to make a tour of manufacturing industries in Italy.

## N. Y. Truck Show Space Allotted

Forty-Seven Dealers Get Space in Garden and Armory—M.A.M.A. Approves Event

NEW YORK, Jan. 6—Practically every inch of available truck space in both Madison Square Garden and the Sixty-ninth Regiment Armory was contracted for at the drawing for floor space in the commercial vehicle section of the nineteenth annual New York Automobile Show, which took place Saturday at the Automobile Club of America.

There are still four spaces unallotted, but for these there are thirty applicants. The only opportunity prospective exhibitors who did not secure space will have to obtain any will be in the event of some exhibitor cancelling space. Practically all of the established motor truck dealers from New York's automobile row, numerous factory representatives and out-of-town dealers were present at the drawing.

## Both Garden and Armory Used

This commercial section of the show will be held Feb. 10-15, immediately following the passenger car exhibit, Feb. 1-8. So large are both sections of the show to be that no single building in New York is adequate to hold either. The Garden and Armory together will house the passenger car section during the first week, and the second week the commercial vehicle section, including motor trucks, delivery wagons, tractors, etc., will occupy both of the show buildings.

Yesterday it was a source of great gratification to the members of the Automobile Dealers' Association, under whose auspices the show is being held, to learn that members of the Motor and Accessory Manufacturers Assn. have decided to exhibit this season as they have at the New York and Chicago automobile shows of the past.

An enormous display of accessories is now assured for both sections of the show. In fact, it should be a record-breaking array for the reason that more floor space is available for accessories than was the case in former years when the entire show was housed in a single building.

Each season numerous accessory makers have been unable to obtain space because of not having applied early enough in advance. With the augmented space a number of these can be accom-

(Continued on page 74)



# Automotive Industries

## Commercial Aviation Here in Few Years Is Surely Coming, Say Profession's Leaders at Big Meeting of Manufacturers' Aircraft Association—Wise Progress Urged—Exposition to Be Held

NEW YORK, Jan. 8—That commercial aviation is a reality of the not distant future, and that the demands upon aviation in peace will surpass the demands made by war, was asserted on numerous occasions last evening at the dinner of the Manufacturers' Aircraft Association at the Waldorf-Astoria.

The dinner brought together the many factors that have been operative in aviation during the period that America was engaged in combat. There were men who designed engines and planes, men who guided their output, men who had to do with their despatch to the front, and the men who flew them over the German lines and brought the war to an end much sooner than the world expected.

And all of these men, speaking from an intimate experience that is not the good fortune of those who have been more remotely placed, spoke confidently of transatlantic flights, planes engaged in mail and commercial work, long flights and safe landings in now impossible spots, made possible by the designs that will come through the demands of peace just as present designs came in response to the demands of war.

As a first step in the big future that all expect for aviation is the Aeronautical Exposition which the association will hold in Madison Square Garden Feb. 27 to March 6. It is expected that at least fifteen complete planes can be shown in the Garden, and with them the detail of the many designs and engineering features that have hastened into being during recent months.

It was urged that there be schools of aviation, just as there is an army school at West Point and a navy school at Annapolis. The country now has hundreds of trained fliers, all anxious to keep on flying, and it was held that if progress is wise and not too forced the science and art can be developed highly within about five years. It was suggested that present aircraft manufacturers be encouraged to continue their aviation activities in parts of their plants.

I think, said John D. Ryan, former head of air work, the peace requirements—and I don't believe I am overoptimistic—will in time startle the world. I don't think it is coming to-day, and I should regret very much if it were pushed too much. I think with care and caution and development, and trial, that the aeroplane can be made as necessary in peace almost as it is in war, and I believe it is in good hands. I believe the manufacturers of this country, who are in the aircraft business to-day, will see it to their own interests to proceed cautiously, carefully, and make as few false starts as

possible, develop it on broad lines and bring it to the fruition it deserves.

I should think that it would be plain to almost anybody that in the necessity for the defense of a great country like ours, with a great coastline like ours a very extensive aircraft program is a very desirable thing.

I think the science of aviation should be encouraged in every possible way. I would have an academy of aviation, just as we have a military academy at West Point and a naval academy at Annapolis. I would educate the boys of this country from the time they are boys, in aviation, strictly, and almost exclusively, and I think that with the proper expenditure and the proper direction, within five years from now an enemy fleet that attempted to reach the shores of the United States would be detected and located so far out at sea that it would be put out of business three or four hundred miles beyond the reach of the shore. (Applause.)

I don't think there is anything in the nature of a dream about that. I don't think that any one who studies what has been accomplished in aviation, and who thinks what might be accomplished, can consider that at all a dream.

We now have planes that have a long range. We will have planes with a longer range, not necessarily the fastest planes, but planes with a long range that could absolutely detect the presence of a hostile fleet on its way to these shores, at least five or six hundred miles before they could reach us. Not deprecating in any way the great naval defense that we want in this country, and that we must have, I would say the planes could locate the fleet and the navy could destroy it; it could be told where it was and destroyed before it could reach us.

I think it is a great pity that the brains in the aircraft organization, naval, as well as in the army, should be scattered. I think that the civilians who have come into this work, able engineers who have gone so far in this work, should be used, should be kept, should teach the younger generation all they know, pass it along, and that these great organizations that have been got together under the stress of war should not be dissipated and go back to their civilian employments without leaving with the country the benefit of all they have learned.

I think that the great manufacturing organizations should not be destroyed or allowed to fall into disuse. I don't advocate the building of great numbers of aircraft for military purposes. I don't think it is necessary. But I think that sufficient encouragement and employment can be given to the well-developed aircraft factories of this country to keep them in the aircraft business, to induce them to make every discovery, to do everything they can to promote the science of aircraft. The organization should be kept intact, and the men who are able and who have done this thing should be kept together as far as possible. It would be a small expense, and God knows it might be a great measure of economy some day.

Some people have criticized our work in aviation on the front, some people have said we have been too reckless. People have told me that our boys were too reckless if anything; the French told me that our boys were too reckless; some of our own good friends have said that our boys were too reckless, but God bless them! That is what won the war, the fact that our boys were too reckless.

I saw them in France when the clouds were low, and when it wasn't a fit day for anybody to take the air, go out and fly 50 and 60 meters above the ground and bring back a complete record of what was ahead of them. General Pershing told me when I talked with him, on the second day of the battle of the Argonne, that no army ever went out with the information as to what was in front of it as the American army did in St. Mihiel and the Argonne.

Probably the loudest cheers of the evening were for Col. W. A. Bishop, Canada, who has an official record of having brought down 75 planes. A modest young man of 24, he is said recently to have been called a "coward" by a humorous friend because he was "afraid" to sit in the front of a box at a theater. However, last evening he was styled the "All American Ace," and, after telling a bit about aviation in war, he had this to say about aviation in peace:

Speaking of the future of aviation, one can only say that aviation has been made by this great war. At the beginning of the war it was a dream of the pioneer of fliers that flying machines should help to scout and do other work, and they did at the beginning of the war, but no dreams that those pioneer fliers could possibly have had could possibly picture the wonderful development which aviation has had during the past four years.

Each month of the whole course of those four years new improvements and new machines have steadily come to the different fronts, and with those improvements and those new machines new work has developed for the aeroplane, and instead of, as was at first thought, an aeroplane would simply do scouting work and the odd bit of looking around here and there, it now takes part in every action in any kind of warfare, and no action is complete without its perfect cooperation.

I feel convinced—and really I have seen aeroplanes do some extraordinary things—I feel absolutely convinced that the future of aviation is not in warfare; it is in commerce and I think that the wonderful record, the science of flying has had will be equaled and surpassed in the next few years by the development of commercial aviation. The first startling thing will be the transatlantic flight, and as every man here knows that is not far off, not for one machine, but for many machines. At the end of another year I feel quite confident that scores of machines will have crossed the Atlantic.

And a great number of men here to-night will doubtless take that trip. This trip will without doubt be done not only in the big machines, but in the small machines. Both of these types have their advantages for commerce. The general idea among the outside public seemed sometimes to be that the only machine fit for a commercial purpose is the big, many-engined machine. This machine undoubtedly has tremendous advantages in carrying weight, in going long distances, and by reason of its two, three or four motor engines, it may be more reliable, but the engines which have been turned out of late in your country, in England and France and Italy, have shown us that single engine machines may now be reckoned upon to be absolutely reliable, and that a person flying a machine with one engine, one of the good ones, may rely on that engine not to let him down.

This is undoubtedly the biggest step that  
(Continued on page 78)

### Massachusetts Wants Higher Fees

BOSTON, Jan. 4—Motor truck owners, and dealers in trucks and cars throughout Massachusetts will find that they will have to pay a very much larger sum to the State if the report submitted by the joint committee to investigate motor matters is accepted by the legislature. The most important, and drastic section provides for the fees for motor trucks. At present truck owners pay \$5 for one ton and \$3 for each additional ton.

The new fees provide:

1 ton, \$15; 1½ tons, \$30; 2 tons, \$40;

2½ tons, \$50; 3 tons, \$75; 4 tons, \$100; 4½ tons, \$150, and 5 tons, \$200.

For every additional ton there would be a charge of \$200.

These fees would be paid by the owners of the motor vehicles.

The dealers at present are allowed a number of license plates for their cars, which are registered at a lower price than those in use all the time by owners. The report suggests that dealers pay the same fees as owners, and where a large dealer has a number of machines it will jump up his expenses considerably.

On top of that comes the division of motor dealers into three classes; those who sell machines, new and used; those who deal in used cars solely; and those who buy cars for junk.

They must all take out licenses in the city or town where they do business. And a fee for this may be charged as high as \$100. Moreover, they must report every day to the Highway Commission every car or parts of machines taken in trade or bought.

Also those licensed under Classes II and III must hold their cars at least 4 days before reselling unless given special permission. This is the outcome of the hearings held for the past 2 years on the question of stopping the thefts of motor cars.

The load on trucks is restricted to 6 tons, and the length over all of trucks and trailers to 26½ ft.; height 11 ft.; width 92 in. Jitneys are to be limited to their carrying capacity for seats.

#### Remove Import Restrictions on Balata

WASHINGTON, Jan. 2—Restrictions on the import of balata, gutta-percha, gutta-joolatong and gutta-siak have been removed by the War Trade Board and licenses will be granted for any quantity providing that the bills of lading are endorsed by the Rubber Association of America, Inc. Government option prices on this rubber are withdrawn.

This relaxation of import restrictions does not authorize the importation of the above named rubbers from any country other than the primary or overseas markets.

#### Reo Guarantees Price

LANSING, MICH., Jan. 4—The Reo Motor Car Co. has guaranteed present prices on its various models until July 1. They are as follows: Five-passenger, \$1395; three-passenger, \$1395; four-passenger Coupe, \$2175; five-passenger Sedan, \$2175; Speed Wagon Chassis, \$1250.

## Workers Increase 3%; Wages, 23%

### 48 Automobile Makers Employ 117,290 in September and Pay Them \$3,215,836

WASHINGTON, Jan. 3—Reports received by the Department of Labor from automobile manufacturers indicate a slightly increasing employment and a greatly increasing wage scale.

Forty-eight manufacturers reported 117,290 workers for September, 1918, 3 per cent more than the 113,889 workers employed in the same week of 1917. The wage scale for September, 1917, for these factories totalled \$2,614,888, while in 1918 it amounted to \$3,215,836, an increase of 23 per cent, which is highly significant as contrasted with the increase of 3 per cent in the number of workers.

Forty-three automobile manufacturers reported 103,931 workers for August, 1918, as compared to 105,673 for September, 1918, an increase of 1.7 per cent. The pay-roll for August, 1918, totalled \$2,856,530, as compared with \$2,924,456 in September, 1918, an increase of 2.4 per cent in contrast with the employment increase of 1.7 per cent, indicating that as late as September of this year wages were still increasing.

In a few instances, states the Department of Labor, there have recently been reports from some automobile manufacturers of slight decreases in the wage rate increase.

An average increase of 15 per cent affecting 30 per cent of the force was granted by one manufacturer. The shop employees in one factory and approximately 10 per cent of the organization in another received a 10 per cent increase.

One establishment reported 50 per cent of the force given a 5 per cent increase, while another establishment reported an increase of 5 per cent affecting 21 per cent of the employees. One-third of the force in one plant and the entire organization in another plant received increases, but no data were given as to the amount of the increase. A productive average hourly rate in one establishment was reduced approximately one-half cent.

Following is a complete comparison of employment in 13 important industries of the United States, indicating extraordinary increases in wages in every instance as compared to the increase of workers. Car building and repairing, it

will be noted, has the highest rate of increase, with 104 per cent wage increase and 23 per cent workers' increase.

#### Good Coal Production for Year

WASHINGTON, Jan. 3—Bituminous coal production for the week ended Dec. 21 was 10,136,000 tons as compared with 10,616,000 tons the corresponding period of last year. Anthracite production for the week ended Dec. 21 totalled 1,839,000 tons as compared with 1,778,000 tons in the same period of 1917. The decrease in bituminous production was largely in Ohio, Pennsylvania and West Virginia. Illinois, Indiana, and South and West fields reported slight gains. From April 1 to Dec. 21 the total bituminous production was 441,361,000 tons compared with 402,824,000 tons in the same period of 1917. For the same period anthracite production totalled 72,541,000 tons this year as against 73,954,000 tons last year. During the week ended Dec. 14, coal production was 27 per cent less than 100 per cent due to the fact that there was no market, causing 11.3 per cent loss, labor shortage 7.4 per cent, car shortage 4.3 per cent, mine disability 2.9 per cent and all other causes 1.1 per cent.

#### Agricultural Implements Off Import List

WASHINGTON, Jan. 2—Agricultural implements have been removed from the list of restricted imports by the War Trade Board. The removals from the list also include nickel, zinc and grease. Licenses will now be issued for the importation of these commodities.

#### Vacuum Oil Company Restrained

WASHINGTON, Jan. 2—The Vacuum Oil Co., New York, was ordered to-day by the Federal Trade Commission to discontinue shipping its products without having previously sold or received orders for them from customers, prospective customers, or customers or prospective customers of its competitors. The order further prohibits the company from "inducing or attempting to induce in any manner whatsoever" consignees to accept such unbought or unordered shipments. The company has admitted, states the Federal Trade Commission, to have made shipments at market prices of "large quantities of its products without having heretofore sold or received orders for the same," and attempted to induce the consignees to accept by the extension of long-time credits and guaranteeing resale of such consignments and the assistance of the firm's salesmen in disposing of the

### Summary of Labor Conditions During Month of September. Few Wage Decreases

Industry.	Establishments reporting for September both years.	Period of payroll.	Number on payroll in September.	Per cent of increase (+) or decrease (—).	Amount of payroll in September.	Per cent of increase (+) or decrease (—).
			1917	1918	1917	1918
Automobile Manufacturing	48	1 week	113,889	117,290	\$2,614,888	\$3,215,836
Boots and Shoes	70	1 week	50,036	52,131	715,729	980,828
Car Building and Repairing	35	½ month	39,798	49,248	1,489,856	3,051,904
Cigar Manufacturing	57	1 week	18,393	18,326	224,559	269,453
Men's Ready-made Clothing	39	1 week	22,941	21,568	357,572	416,878
Cotton Finishing	16	1 week	10,970	10,324	162,001	204,386
Cotton Manufacturing	54	1 week	52,525	50,506	596,853	845,032
Hosiery and Underwear	55	1 week	28,412	28,507	315,388	435,765
Iron and Steel	95	½ month	157,524	158,361	7,170,020	9,948,291
Leather Manufacturing	34	1 week	14,583	14,741	234,643	312,722
Paper Making	56	1 week	26,513	27,200	426,906	585,328
Silk	43	2 weeks	14,877	13,127	349,014	423,788
Woolen	50	1 week	43,974	43,330	654,370	852,985



shipment. The order was issued on agreement with the concern, which waived right to introduce testimony in support of the practice.

#### 345,500,000 Bbl. Petroleum Marketed

WASHINGTON, Jan. 2—More than 345,500,000 bbl. of petroleum was marketed from oil wells and field storage tanks in the United States in 1918, according to a preliminary estimate made by the Geological Survey, Department of the Interior. This is a gain of 3 per cent over the output of 335,315,801 bbl. in 1917. The surface reserve of crude oil held by producers and pipe line companies at the end of this year was estimated at 123,000,000 bbl., compared with 150,000,000 bbl. at the end of 1917.

#### Shipments of Tank Cars

WASHINGTON, Jan. 2—The oil industry shipped 505,685 tank cars of oil and oil products from the mid-continent field between Jan. 1, 1917, and Nov. 1, 1918, according to figures made public by the Railroad Administration yesterday. Between April 20 and November 30, 1918, 3585 solid trains of tank cars moved from the Middle Western field, totalling 100,530 cars.

#### Exports to Greece Simplified

WASHINGTON, Jan. 3—A simplified procedure for handling applications for licenses to export to Greece has been arranged by the War Trade Board. None of the many supplemental sheets will be required hereafter, as the particulars of the applications will not have to be sent to the War Trade Board representative in Greece. Licenses for shipments to Greece will be valid until used or revoked and can be used for shipments either direct or indirect and without restrictions as to the flag under which the same is carried.

## Oil and Gasoline Production Normal

Stocks Show Slight Decrease in October, But Ten Months' Figures Are Satisfactory

#### PRODUCTION

	October, 1918	September, 1918
Crude oil (bbl.).....	29,237,767	28,390,431
Gasoline (gal.).....	314,251,318	314,595,959
<b>(Stocks on Hand)</b>		
	Oct. 31, 1918	Sept. 30, 1918
Crude oil (bbl.).....	15,438,756	14,462,100
Oils purchased to be re-run (bbl.).....	1,308,744	1,312,275
Gasoline (gal.).....	250,328,329	269,722,723
Kerosene (gal.).....	419,409,944	436,628,907
Gas and fuel (gal.).....	596,116,351	583,407,769
Lube. (gal.).....	135,196,542	147,425,556
Wax (lb.).....	195,797,590	181,044,508
Coke (ton).....	23,905	16,866
Asphaltum (ton).....	74,159	79,424
Miscellaneous (gal.).....	457,222,127	444,353,139

NEW YORK, Jan. 6—Figures dealing with the output of oil refineries and stocks on hand for October disclose that both production and amount available are around normal, when compared with the totals for September. Production of crude oil has increased from 28,390,431 bbl. in September to 29,237,767 bbl. in October, but the production of gasoline has decreased from 314,595,959 gal. to 314,251,318 gal. The drop in gasoline is so small as to be almost negligible and is in all probability more than compensated for by decreased consumption.

Another factor which will tend to relieve the gasoline position is that smaller quantities of special spirit for aircraft will be needed, even although an increase in the amount required for aircraft employed in postal and commercial service may be expected. Taking gasoline on a daily production basis the average for 10,486,532 gal. per day for the 30 days of September may be compared with the 10,137,139 gal. per day for the 31 days of October.

Gas and fuel oil figures show a substantial increase for the 10 months of 1918, and the production for October was greater than for any other month in the ten. It is apparent that every effort will be made to accumulate a reserve of fuel oil to meet the demands of our new oil-burning merchant marine.

#### British Petroleum Prices Amended

WASHINGTON, Jan. 3—The London Board of Trade has arranged new wholesale prices for petroleum products effective Dec. 16, as follows:

Gas oil in bulk at wharf 17 cents per imperial gallon (1.2 United States gal.)  
Fuel oil in bulk at wharf \$48.67 per ton.

From Jan. 1, 1919:

Spirit in cans—aviation, 77 cents; special boiling points, 72 cents; No. 1, 70 cents; No. 2, 68 cents; No. 3, 66 cents.

Kerosene—long-time burning oil, in bulk, 30 cents; No. 1, 30 cents; No. 2, 28 cents. Raw white spirit ungraded and unrefined, to manufacturers, 55 cents.

All of the above, excepting where otherwise specified, are per imperial gallon, which is equal to 1.2 U. S. gallons.

#### Exports to Belgium

WASHINGTON, Jan. 2—Any commodity destined to Belgium and the Belgian Congo, excepting those included in the present War Trade Board Export Conservation List, can be shipped without application for a license under special export license RAC-65. It is only necessary for shippers to note on the package if it is shipped through the mails or on the export declaration, if shipment is made by express or freight the following:

"Shipped under special export license RAC-65."

Name and address of shipper.

Name and address of consignee.

Statement of contents.

There are no automotive products listed on the Export Conservation list.

#### Total Output of Refineries in the United States for 1917

	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
1917											
January	24,839,772	no account	203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433		184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,138	1st 6 mo.	220,523,571	159,028,978	494,355,838	64,345,221	40,868,930	48,839	52,823	26,977,334	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	52,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	43,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,464,966	64,335,905	40,158,033	42,641	65,272	32,359,401	1,111,511
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	32,708,312	1,286,141
September	27,529,022	2,632,988	256,132,050	143,203,644	629,914,572	60,757,049	48,300,033	42,986	62,520	30,386,471	1,182,560
October	27,698,023	2,863,518	271,891,234	140,559,542	621,492,374	68,516,071	41,181,400	48,849	73,886	31,804,160	1,355,219
Total first											
Ten months	263,759,406	10,308,619	2,336,811,076	1,477,521,728	5,358,879,322	627,824,869	403,235,816	448,376	607,284	527,503,833	10,637,191
November	26,215,979	2,519,700	264,888,709	125,893,202	592,470,037	64,861,375	39,694,595	45,815	73,289	87,115,002	1,203,110
December	25,155,996	2,069,351	248,846,638	123,354,046	561,954,921	61,090,596	38,269,670	45,175	58,852	87,548,408	1,233,528
Total	315,131,681	14,897,670	2,850,546,423	1,726,768,976	6,513,324,280	753,776,840	481,200,081	539,366	739,425	702,167,243	13,073,829

#### Total Output of Refineries in U. S. for First Ten Months of 1918

	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
1918											
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	75,134,088	983,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	48,433	159,374,139	1,338,304
August	28,534,275	6,376,353	330,335,046	149,678,850	671,113,871	72,892,879	41,829,516	51,759	59,715	163,355,034	1,337,327
September	28,390,431	5,485,747	314,595,959	164,963,798	653,085,050	70,593,079	42,704,894	48,052	49,157	138,201,963	1,236,834
October	29,237,767	5,571,847	314,251,318	164,928,640	661,780,441	72,244,633	43,470,132	48,820	51,878	166,109,867	1,161,545
Total	271,654,837	43,232,560	2,965,599,858	1,494,339,319	6,129,120,076	704,299,323	411,655,258	466,523	534,983	1,127,006,493	11,967,250

## Trucks To Be Exhibited at New York Show

## AT MADISON SQUARE GARDEN

Truck	Exhibitor
Atlas	Garland Auto Co.
Autocar	Autocar Co.
Babcock Bodies	Hayes-Diefenderfer Co.
Bethlehem	Graham Brothers.
Chevrolet	Chevrolet Motor Co.
Columbia	A. Elliott Ranney Co.
Day-Elder	Colt-Stratton Co.
Denby	Cole & Dixon.
Dodge Bros.	Colt-Stratton Co.
Federal	Morton W. Smith, Inc.
Fulton	Fulton Motor Truck Co.
Giant	C. T. Silver, Inc.
Graham Truck Attachment	Graham Brothers.
Hall	R. & D. Motors Co.

Truck	Exhibitor
HayDee Truck Attachment	Hayes-Diefenderfer Co.
Lapeer Trailers	Owen Magnetic Sales Co.
Master	C. H. Larson
Maxwell	Maxwell Motor Co.
Oldsmobile	C. H. Larson
Oneida	West Motor Co.
Overland	Willys-Overland Co.
Packard	Packard Motor Car Co.
Reo	Reo Motor Car Co.
Riker	Locomotive Co. of America.
U. S.	W. C. Poertner Motor Car Co.
Vellie	Garland Auto Co.
West	West Motor Co.

## AT 69TH REGIMENT ARMORY

Truck	Exhibitor
Diamond-T	Diamond-T Motor Truck Co.
Garford	Garford Motor Truck Co.
Gramm-Bernstein	C. W. Moody
Hurlburt	Hurlburt Motor Truck Co.
Kelly-Springfield	Kelly-Springfield Motor Truck Co.
Maccar	Pitts Motor Car Co.
Menominee	Menominee Motor Truck Co.
Nash	Kauffman-Storrs Co.
Paige	Paige-Detroit Motor Car Co.
Rainier	Rainier Co.

Truck	Exhibitor
Republic	W. J. B. Co.
Schacht	Schacht Motor Truck Co.
Selden	Manhattan Motors Co.
Signal	R. E. Taylor Corp.
Sterling	Sterling Motor Truck Co.
Stewart	Herrmann Motor Truck Co.
Sullivan	Broadway Motors Co.
Titan	Kauffman-Storrs Co.
Warner trailers	Kauffman-Storrs Co.
Wilcox	Taylor Motors Corp.

## New York Truck Show Space

(Continued from page 70)

modated, although the bulk of the space for parts and accessories already has been contracted for.

The M. A. M. A. relation to the show is not as is commonly called a "sanction." The M. A. M. A. does not sanction shows. It "participates" in them. It buys a block of space and sells it to its members. Or, as in this case, it takes a neutral attitude and is agreeable to exhibiting by any member who cares to do so, except that the member buys space from the show manager and not from the M. A. M. A. The M. A. M. A. buys a block of space at Boston and Chicago. The net result, however, is the same, and the M. A. M. A. is co-operating wherever possible with the New York dealers.

At one time there were rumors of friction, but it has all gone now. The success of the show is more assured now than ever.

A big N. A. D. A. meeting is planned for Feb. 5. Prominent men will speak. The show management requests dealers who plan to come to New York to send in requests for seats at this noon-day luncheon as there may be difficulty in getting a banquet hall large enough. It is planned to secure a luncheon at reasonable rates.

## Expect Keen Bidding for Army Planes

HOUSTON, Jan. 4—There promises to be keen competition in bidding for the purchase of the 1200 airplanes and 2000 airplane engines, now stored at Houston, which the Government has announced it will sell on Feb. 1. Many of the men who will put in bids for airplanes are former army flyers, who want the machines for their private and business use. All bids will be opened at the office of the salvage branch, supply section, office of the director of military aeronautics, Washington, D. C.

The bids will be accepted on the plan of cash down before delivery, f.o.b. cars in Houston, and delivery promised within ninety days from the day the bid is ac-

cepted. Each bid must be accompanied by a check for 20 per cent of the proposal, and the Government reserves the right to reject any or all bids and also reserves the right to accept the bid on the unit basis. Bids will be accepted for one or more of the airplanes and the same applies to the airplane engines.

## Chicago Accessory Space Allotted

CHICAGO, Jan. 6—Space for the nineteenth annual motor show in Chicago has been allotted to its members by the Motor and Accessory Manufacturers' Association, both for the passenger car exhibition, Jan. 25-Feb. 1, and the truck, Feb. 3-6. Ninety-five spaces were assigned for the former dates and fifty for the latter. Sam Miles, manager of the show, also has on file applications for space from forty manufacturers of accessories who are not members of the M. A. M. A.

## American Forging to Meet

PONTIAC, MICH., Jan. 7—The annual meeting of the stockholders of the American Forging & Socket Co. will be held Jan. 15. Action to increase the capitalization from \$250,000 to \$350,000 is contemplated, and a resolution advocating the increase will be submitted to the board of directors to be chosen at that meeting. On Dec. 30 a 6 per cent dividend was declared. This is payable in four equal instalments of 1½ per cent on Jan. 15, April 15, July 15 and Oct. 15.

## Copper Production Increases

WASHINGTON, Jan. 2—Copper production in the United States in 1918, although slightly larger in quantity, showed a decrease of nearly \$40,000,000 in value compared with 1917 figures.

At an average price of about 24.75 cents per lb. the 1918 output had a value of \$473,000,000, as against \$510,000,000 for the previous year, according to a report of the United States Geological Survey just made public.

Production of blister and Lake copper was 1,910,000,000 lb., as against 1,886,-

000,000 lb. in 1917. The supply of refined copper aggregated \$2,450,000,000, compared with \$2,362,000,000 during the year before.

Imports of copper in all forms during the yearly period amounted to 535,868,000 lb., and the exports totalled 1,126,082,000 lb.

Arizona, Montana and California mines showed an increase of production, while those of Michigan, Utah, Nevada and New Mexico fell below the 1917 output.

## Nineteenth Used Car Market Report Out

CHICAGO, Jan. 8—The Nineteenth Edition of the National Used Car Market Report has just been issued by the Chicago Automobile Trade Association. It shows "as is" sales from June 21 to Nov. 21, and gives appraisal prices for December, January and February. To the long list of car names, representing both modern and ancient automotive history, have been added the names Bell and Templar. In the case of the Bell no figures are given, as only a 1919 model is listed and there has been little sale of used cars of this make. The same applies to the Templar, of which 1919 touring and roadster models are listed.

## Samples Can Be Exported

WASHINGTON, Jan. 2—Samples can now be exported by mail, freight, express, in passengers' baggage or otherwise without individual export license. The new ruling issued to-day by the War Trade Board also authorizes the export without individual licenses of advertising matter to be used in connection with samples. The term "samples" is construed to mean any articles intended for use in soliciting orders but not to include any article intended to be sold as an article of commerce. It is necessary to note on the package of the sample if the shipment is made through the mail or on the export declaration, if the shipment is by mail or express:

"Shipped under Special Export License No. RAC-55."  
The name and address of the shipper.  
The name and address of the consignee.  
A statement of contents.



The attention of exporters is called to the fact that the use of this special license number does not relieve the shipper of the responsibility of complying with the import restrictions of the country of destination. For example, exporters are advised that at present the customs restrictions of the United Kingdom forbid the entry into that country, as samples of motorcycles, auto-peds and complete motor cars. Other countries have similar restrictions and exporters should determine first what the restrictions are.

#### N. A. C. C. Takes Up Peace Problems

NEW YORK, Jan. 8.—To-day's meeting of the Board of Directors of the National Automobile Chamber of Commerce extended an invitation to C. C. Hanch, chief of the Automotive Products Section of the War Industries Board, to visit the European countries to investigate automobile conditions in connection with the export trade of American manufacturers. While in Paris he will attend the Inter-Allied meeting called by the Chambre Syndicale des Constructeurs d'Automobiles as the representative of the automobile industry, to discuss custom rates, shows and other matters of international importance. Representatives of England, Italy and Belgium will also attend.

The traffic committee's report showed that the automobile industry is slowly getting back into production, although carload shipments for December were only 8210 as compared with 15,827 carloads in December, 1917, which is 51 per cent of normal. N. A. C. C. traffic officials reported on their meeting with the Packing Service Branch of the War Department, which is developing new methods of loading automobiles in freight cars, to permit the easier handling of vehicles with economy of space. The Packing Service Branch is establishing specifications for packing and loading articles of all kinds and the industry will co-operate with it in handling automobiles.

The meeting discussed the question of locking devices with a view to giving added safety to motorists from car stealing, which is becoming so prevalent. A complete investigation will be made and reports given to automobile manufacturers.

New standards for tires were considered, the plan calling for a continuance of the making of tires for all rims in use, but providing that after Jan. 1, 1920, the manufacturers will equip their cars with certain sizes that are being considered. Pneumatic sizes will run from 30 x 3 1/2 to 36 x 5 for passenger cars and for trucks 36 x 6 to 40 x 8. There will be fourteen pneumatic sizes in all. Truck sizes call for fifteen sizes of solid tires. The whole program is expected to make for greater efficiency in manufacturing and the certainty of dealers' stocks being complete without being too heavy.

It is reported that Canada has virtually raised the embargo on the importation of motor cars by freely granting licenses for their importation into Canada.

The N. A. C. C. will hold a convention of motor truck manufacturers during the week of Feb. 10, coincident with the motor truck show in Madison Square Garden in New York, when standardization, sales and other plans for the industry will be discussed.

#### New Apperson Export Model

KOKOMO, Jan. 9.—The Apperson Bros. Automobile Co. will shortly make public the details of a new moderate-priced model especially adapted for export trade. The company has arranged to maintain its export headquarters with C. T. Silver, Inc., former Apperson distributor for the Metropolitan territory. The export department will be in charge of Geo. H. Strout who henceforth will make his headquarters in the Silver establishment at 100 West 57th Street, New York.

## Rules for Ending Contracts

### Method of Procedure Outlined by Lt.-Col. Blyth—Individual Forms Available

WASHINGTON, Jan. 2.—Instructions to manufacturers for the termination of contracts for war materials have been compiled by Lt.-Col. L. W. Blyth, Chief of the Settlements Division of the Purchase, Storage and Traffic Division, United States Army. The instructions include directions for making:

- 1—Inventory of unworked direct materials.
- 2—Inventory of indirect materials.
- 3—Inventory of worked direct materials.
- 4—Inventory of direct labor and overhead expense.
- 5—Statement of scrap from worked materials.
- 6—Commitments for materials.
- 7—Claim for other compensation.
- 8—Recapitulation sheet.
- 9—Statement of claim.

Following is the complete list of instructions. Individual forms will be furnished to the manufacturers.

#### Instructions to Contractors in Preparing Claims Based Upon the Suspension or Cancellation of Contracts.

1. For the purpose of submitting claims under contracts, contractors will be furnished with the following forms: Finance Form No. 1, Inventory of Unworked Direct Materials; Finance Form No. 2, Inventory of Direct Materials; Finance Form No. 3, Inventory of Worked Direct Materials; Finance Form No. 4, Inventory of Direct Labor and Overhead Expense; Finance Form No. 5, Statement of Overhead Expense; Finance Form No. 6, Statement of Scrap from Worked Materials; Finance Form No. 7, Commitments for Materials; Finance Form No. 8, Claim for Other Compensation; Finance Form No. 9, Recapitulation Sheet; Finance Form No. 10, Statement of Claim.

2. Wherever it is possible and practicable for the Contractor to fill out the forms submitted, the information should be furnished accordingly. When impracticable to use these forms, the information should be presented by the contractor in such a manner as may be approved by the settling authorities and as will allow of proper examination and determination. As all claims presented by contractors will be subject to complete verification before full reimbursement is made, unusual care should be taken in the preparation of any statement.

3. The heading on each form should be filled out to show the proper official title of the contracting firm or corporation as it appears in the contract; location of the plant and general offices; Department of the Army which issued the contract, such as Ordnance, Quartermaster, Signal Corps, etc.; contract or order number; name of the article contracted for; the number of each sheet, sheets to be numbered consecutively according to classification; date on which work was actually stopped; and date inventory was actually taken.

4. The quantities shown in the inventory should not be in excess of that required to finish the contract.

5. The following brief explanation of the use of each form is given for the guidance of contractors in their preparation:

#### Inventory of Unworked Direct Materials

After the term "classification" on this form the particular class of material as purchased should be shown. This material may be either raw material, such as steel, copper, brass, etc.; or it may be in the form of component parts purchased, such as forgings and castings of a particular pattern, copper bands, wheels, axles, transmissions, etc. For each class of material, as above stated, a separate sheet should be prepared.

Only such component parts as have not entered into process of manufacture should be detailed on this form.

In the body of the form, under the heading "Full Description of Material, Name of Suppliers (Vendors)," such detailed information should be listed as may be necessary to easily identify the item in question. In the proper columns there should be entered the date upon which the item in question was actually received by the contractor; the quantity thereof; the unit of quantity, such as yards, pounds, tons, etc., and the cost of each unit (inclusive of freight). The last column should show the total amount of each item.

#### Inventory of Indirect Materials

On this form should be inventoried claims for all materials purchased and on hand at contractor's plant to be used in connection with the manufacture of the articles under the contract, but not to become a part of the articles themselves. Examples of indirect materials are oil, grease, waste and sundry factory supplies. Separate sheets should be prepared for each classification of such indirect materials, in the same manner as in the case of Unworked Direct Materials, previously explained. The body of the form should be filled out in the same manner.

#### Inventory of Worked Direct Materials

On this form should be inventoried all raw materials and component parts purchased which have actually entered into process of manufacture and have had labor and overhead expended upon them. It will not be necessary to classify this material as in the case of Unworked Materials, inasmuch as it is all to be listed as component parts of the articles to be manufactured.

#### Expenses, Direct Labor and Overhead

The purpose of this form is to show the direct labor and overhead applicable to the Worked Material as shown on the preceding form.

If it is impracticable to apply the amount of direct labor and overhead against the individual items as listed on the preceding form, the items need not be set forth at length, but the form should show the total amount of direct labor and overhead applicable to the Worked Materials as a whole.

#### Statement of Overhead Expense

The purpose of this form is to establish a rate of overhead to be applied to work in process on the basis of direct labor. This overhead rate is to be established on a basis of the contractor's overhead expenditures for a period of three months preceding the date of cancellation of the contract. The expense accounts should be listed on this form to show classification and amount. The total amount of direct labor on all contracts is to be ascertained for the same period as stated for the overhead. In order to obtain the percentage of overhead to be added to direct labor the total direct labor should be divided into the total overhead. For instance, if the direct labor for the period amounted to \$16,000 and the total overhead for the same period amounted to \$14,000, \$16,000 divided into \$14,000 would show a percentage of 87.5, which would be the rate to use.

In the majority of cases it is assumed that only one form sheet will be needed to list the expense accounts, and the form therefore provides for totaling such accounts, setting up the total direct labor on the line next below and showing the rate obtained. Where the expense accounts are too numerous to be listed on one sheet, the total may be carried forward to additional sheets and the direct labor and percentage shown only on the last sheet used.

Where the contractor has an established system for distributing overhead, this system may be used in connection with the Government contract, in so far as it may be applicable. In certain instances, it may be impracticable to distribute overhead on the basis of direct labor, and in such instances other equitable methods may be employed. In any event, the method used should be clearly set forth on this form, in the columns expressly provided therefor.

Items of overhead expense should be in accord with Ordnance Department pamphlet entitled "Definition of 'Cost' Pertaining to Contracts," a copy of which will be furnished contractors. In no event should expense accounts be listed which bear no relation to the department or departments of contractor's plant wherein the contract is performed.

#### Statement of Scrap from Worked Materials

In cases where contractors make claim for the gross value of all raw material or

(Continued on page 77)

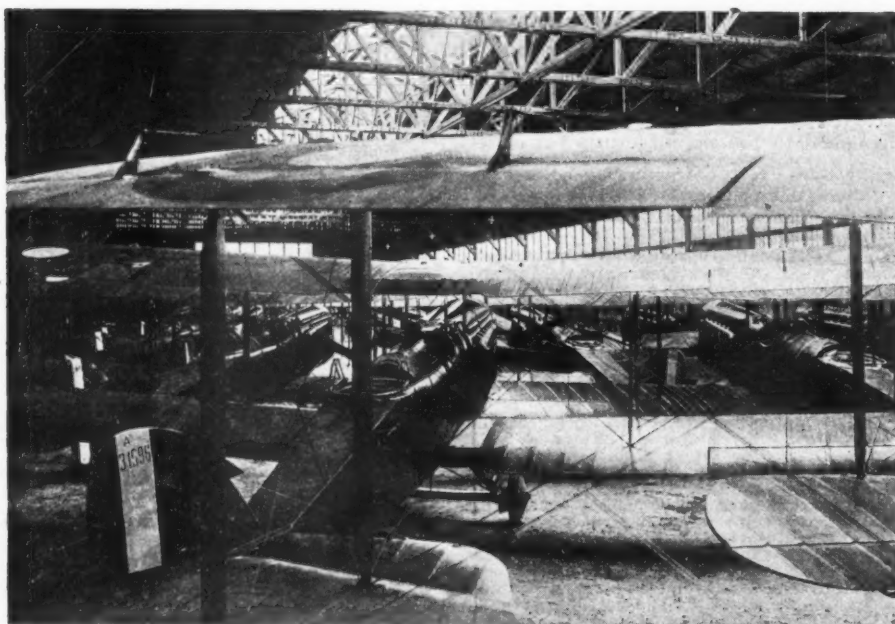
## French Liberty Plane Depot



*This Liberty plane depot, which is at Romorantin, is the largest assembly plant in France. This photograph was taken Nov. 11, 1918*



*The Romorantin Liberty plane assembly plant, of which this is another view, is located 180 miles from Paris*



### Fly From England to India

PARIS, Dec. 18—*By mail*—For the first time the journey from England to India has been completed by airplane. The trip which ended at Karachi, India, on Dec. 17, was made in a Handley-Paige bombing plane equipped with four Rolls-Royce Eagle engines and was piloted by Maj. A. S. MacLaren and Captain Halley. The total mileage was close to 6000 and was made in a number of stages varying in length from 652 to 1170 miles.

### Two Long Seaplane Flights

NEW YORK CITY, Jan. 4—Two long flights in navy seaplanes have recently been completed, one from the Naval Air Station at Pensacola, and the other from Norfolk, Va. Lieut. T. C. Rodman, U. S. Marine Corps, on Dec. 30 flew 900 miles from the Pensacola station, carrying eleven passengers. The same day Lieut. Commander Bollinger, U. S. N., covered

a distance of 651 miles from the Norfolk station without stop, carrying five passengers.

### Altitude Record Now 30,500 Ft.

NEW YORK CITY, Jan. 4—A new world's record for altitude has been made by an American pilot flying a British plane and carrying one observer. On Jan. 2 Capt. Lang, R.A.F., attained an altitude of 30,500 ft. in 66 min. 15 sec. The best previous record was made by Capt. B. W. Schroeder, an American pilot, who reached an altitude of 28,900 ft. on Sept. 10, 1918, at the Wilbur Wright Aviation Field at Dayton.

### Rickenbacker Again Cited

PARIS, FRANCE, Jan. 4—(Special Cable)—Capt. Edward Rickenbacker, foremost among American aces, has won further distinction. He has been awarded the French Legion of Honor in recognition of his military services.

### Mexico May Remove Import Duty

MONTEREY, MEXICO, Jan. 4—Assurances have been received here from the City of Mexico that the Federal Government will issue a decree soon removing all import duties on automobiles, motor trucks and other motor vehicles. In anticipation of this being done arrangements are being made for a great expansion of the automobile trade in all the principal cities of the country. While the actual orders for motor vehicles of various lines will not be placed until the decree is issued, dealers and others are making up lists of their possible requirements in these respects and the purchases will be made with a rush when the duties are removed. It is expected that dealers in El Paso, San Antonio, Laredo, Eagle Pass and Brownsville will profit largely as a result of the proposed new decree. While during the last several years there has been a more or less continuous and large trade in used automobiles in Mexico, the time has arrived when the demand for new cars must be filled. This is true, it is stated, as to motor trucks. With a revival of mining and other industries in this country motor trucks are rapidly coming more and more into use. It is largely a virgin field for that trade and offers enormous possibilities in the way of expansion, according to American dealers who have been investigating the situation here.

### Chandler Prices Revised

CLEVELAND, OHIO, Jan. 6—The Chandler Motor Car Co. has revised its prices as follows:

Model	New Price	Old Price
7-pass. tour.....	\$1795	\$2095
4-pass. road.....	1795	2095
Sedan .....	2495	....
Coupe .....	2395	....
Limousine .....	3095	....



## Summary of Business Conditions as of Date Nov. 23, 1918

The following summary of general business conditions in the United States is compiled from reports received by the Federal Reserve Board from the twelve reserve bank districts:

District.	General business.	Crop condition.	Industries of the district.	Construction, building, and engineering.	Foreign trade.	Money rates.	Railroad, post office, and other receipts.	Labor conditions.
No. 1—Boston....	Hesitating.....	.....	Busy.....	Increase in value..	Decrease.....	Firm.....	Post office receipts mixed.	More plentiful.
No. 2—New York..	Volume decreasing, except retail sales; profits decreasing; collections good.	Good.....	Reduced activity; many orders canceled.	Normal seasonal inactivity; outlook improved by removal of Government restrictions.	Stimulated interest; some uncertainty.	Slightly lower...	Increase.....	Very little shortage since armistice was signed.
No. 3—Philadelphia	Very good.....	.....do.....	Very busy.....	Building at low ebb, but prospects bright.	.....	Continue firm...	Increasing.....	No labor disturbance expected.
No. 4—Cleveland..	Satisfactory.....	.....do.....	Busy.....	Inactivity.....	.....	Tendency to increase.	Increase.....	Scarce.
No. 5—Richmond..	Resuming activity after effects of influenza.	Tobacco active at high prices; cotton held for 30 cents.	Limited only by supplies and labor.	Preparations being made to resume activity.	Inactive.....	Active demand, 6 per cent.	Railroad facilities improving post office in full volume.	Thought to be improving.
No. 6—Atlanta....	Satisfactory.....	Good.....	Continue active..	Very quiet.....	Quiet.....	Stationary.....	Stationary.....	Fair.
No. 7—Chicago....	Good but reflecting conservatism.	Excellent.....	Active.....	Dull but showing improving tendency.	.....	Firm at 6 per cent.	Post office receipts decrease.	Scarce and restless.
No. 8—St. Louis...	Good.....	Winter wheat excellent.	Readjusting to peace basis.	Quiet.....	.....	Firm.....	Increase in postal receipts.	Improving.
No. 9—Minneapolis	.....do.....	.....	Slowing down...	Slow.....	.....	.....do.....	No change.....	Good.
No. 10—Kansas City	Continues active.	Condition normal; outlook excellent.	Active.....	Dull but promising revival.	Heavy on metals.	Firm, 6 to 7 per cent.	Heavy.....	Recovering from influenza.
No. 11—Dallas....	Satisfactory.....	Condition good; outlook promising.	.....do.....	Inactive.....	Increase in October.	No changes; firm at 6 to 8 per cent.	Railroad increased; post office 21.8 per cent increase in October.	Unsettled and unsatisfactory.
No. 12—San Francisco.	Volume large, collections good.	Good.....	.....do.....	Decreased; new projects under consideration.	Increasing.....	Firm and stationary.	Increasing.....	Full employment.

## Contract Termination Instructions

(Continued from page 75)

purchased components put into process of manufacture, the United States is entitled to scrap resulting, and credit for the full market value of such scrap must be given by contractors in preparing final statement of claim.

The scrap resulting from or applicable to materials in process of manufacture must be determined as accurately as possible and reported on this form. Care should be taken that separate classes are separately reported.

It is appreciated that in many instances it will be impossible to physically separate the particular scrap applicable to material in process. Where this is the case, it must be accurately estimated and full credit given, as contractors will be held strictly accountable for the proper proportion of scrap.

## Commitments for Materials

This form is to be used to list purchase orders for materials for use on the contract which have not yet been invoiced to contractor by the supplier, but represent commitments on account of which contractor desires to make a claim. It is very important to show the name of the supplier in each instance, as well as a full description of the materials ordered. Classification is required as in the cases of material inventories and a new sheet should be used for each classification.

The date on which the order was given, together with full description of the quantity ordered, unit price and total amount, should be fully set out in the case of each item.

## Claim for Other Compensation

In addition to claims based upon inventories and commitments, claims may be made by contractors to compensate for losses actually incurred by them on account of the termination before completion of a contract with the United States.

Contractors who contemplate making claims against the United States for losses incurred by them on account of termination of contract are advised that in every case conclusive evidence must be furnished. It is not sufficient that a contractor show

cause for loss, but must submit proof of actual loss sustained.

Contractors are required to submit claims on this form, and support such claims by clear proof, documentary where possible, to the full satisfaction of the board or other agency of the United States having jurisdiction.

In adjusting a claim for other compensation with the prime contractor, in which there is included a settlement with sub-contractors, it will be necessary for the prime contractor to furnish proof of adjustment and settlement of sub-contractor's claim prior to payment.

## Recapitulation Sheet

This sheet is to be used to recapitulate and tie together the various inventories and statements, and to avoid the necessity of a large number of signatures, certificates, etc.

A recapitulation sheet should be used in connection with each inventory or statement where more than one sheet is required. In making up inventories and statements, totals should not be carried forward from one sheet to the next, but should be posted to the recapitulation sheet and the final total of each inventory or statement obtained by totaling the amounts appearing on such recapitulation sheet.

On the reverse side of this form appear the various certificates which will be required before payments may be made on account of the various claims. Not all of these certificates will be required in every instance, but a person duly authorized by the contractor must sign the contractor's certificate in the case of every inventory or statement. The other certificates are for signature of War Department officials and will be filled in at a later date when required.

## Statement of Claim

This form is prepared for the final presentation of contractor's entire claim to such board or other agency as may have authority to hear and determine it.

As explained on the face of the form, it is, in effect, a final recapitulation of all the elements of the claim as set forth on the various forms previously referred to.

It is not expected that in all instances contractors will make claim for the full amount of inventories and other items set out and in such cases proper deductions may

be made on the face of this form, accompanied by a clear and concise explanation thereof.

On this form should also appear all proper deductions for advances previously made to contractors by the United States in connection with the contract upon which claim is made.

The final balance appearing on this form should represent the contractor's net claim on account of the suspension or termination of his contract.

On the reverse side of the form will be found the certification and affidavit required in connection with each contract, and these should be carefully filled out and executed before claim is forwarded.

## General Remarks

1. Where a contractor has more than one contract with the United States, great care should be taken that claims on account of each are accurately separated and so reported, as all settlements will be made by contracts and not by contractors. A complete report must therefore be submitted for each contract, and in no case should inventories contain items to be used for more than one contract even though such contracts be for identical articles.

2. Material which is the property of the United States shall not be inventoried. Where advance payments have been made by the United States to contractors on account of materials, the title to such materials has passed to the United States and the contractor's claim for any balance due should be set up as a claim for other compensation on the form provided therefor.

3. One original and five copies of all papers must be forwarded to the Government agency having jurisdiction. Only the original should be signed; on the copies all signatures should be typed in.

4. Wherever these instructions cannot be followed to the letter, the greatest care should be taken to conform as nearly as possible. This is in the contractor's interest, inasmuch as claims properly prepared will be settled with the least confusion and delay.

5. Wherever it will be impossible or impracticable for the contractor to present his claim as set forth herein, he should immediately get in touch with the proper agency having jurisdiction in his district and assistance will be furnished him as rapidly as possible.

## Commercial Aviation Here in Few Years

(Continued from page 71)

flying has taken, because in the past the people were very frightened of flying over bad country, continually worrying. I have done it myself, of landing in corn fields and like fields, woods and all sorts of things. Now with engines that one can rely on we feel absolutely confident that it will carry you through. The little machine will be cheaper in every way. It will, of course, not bring the same results with the one exception of speed, but it will always be the fast machine.

I think that it is an extreme case, but you might compare the big machine as you would compare an ordinary roadster to a bus, and I believe in the ordinary machine. I would certainly take it if I were going on a long trip from here to Chicago, preferring the roadster to the bus. The Atlantic will certainly be flown in the course of the next six months by more than one machine of the two, three and four passenger class.

Now, your country is full of young, keen, fully developed, wonderfully trained pilots. These people must have employment, they wouldn't want to give up flying either; there is no necessity for it. The future of aviation in the commercial sense will need every one of those men and you are a very lucky country to have such wonderful men trained and eager to fly.

While H. Snowden Marshall, who investigated the aircraft situation, was expected by the audience to say a lot about his investigation, he said little in detail. He stated that things were not as bad as painted and that the aircraft work done was a most creditable achievement. He also urged that the experience gained through the progress made thus far be not lost through a slump in aircraft development.

Lieut. H. H. Emmons, who was in charge of aircraft production, cited figures that reflect very favorably on the efforts of those engaged in aviation work during the war. He said:

For the eight years prior to 1916 the Army had ordered fifty-nine airplanes and had received fifty-four. During the year 1916 the Army had ordered 366 planes and had received 64. In other words, for the nine years prior to 1917 the Signal Corps of the Army had received the enormous sum of 118 airplanes. That was the equipment that they had had up to the date that we started this business and that was all that they knew about them. Now, from that we had to start with a program laid down by the joint army and navy technical board, calling for over 9,000 training planes and over 20,000 combat planes, and you gentlemen who have made any of this material know what it meant to tackle a job of that kind.

Now you made 9,000 of the training planes, you made the 16,000 training engines, and every one of them had been delivered and put into service, gentlemen, before the armistice was declared.

On the combat engine side we were oppressed with a multiplicity of advice; as a result of which it was determined to put our main effort upon the Liberty engine, going into the arguments for or against it. I am simply going to call your attention to this fact, that on the 19th day of May the first stroke of the pen was made to design the Liberty engine, the first engine was built complete and delivered in Washington on the fourth day of July, less than six weeks. It was extended into a 12-cylinder engine and the first one was built and passed the 54-hour test by the 25th day of August of that same year and was pronounced a success and ready for production.

We started to produce that engine, which was rated at a horsepower of 330. When we had tooled and jigged up for it and gotten the factory ready and had produced several hundred of them we were told to increase the horsepower. It was boosted to 375, with the resulting changes in the tools and equipment. When we had made some four or five hundred of them we received our final instructions from abroad, and I might say to you that most of the things you have felt disposed to criticize you will find were done by us because we were told by the authorities under whom we were working that that was what was wanted, and that we should do it.

We received our instructions from the other side that if we could produce an en-

gine of 400 horsepower or upward we would have the engine that would do wonders in 1917 and 1918. Many changes were required to get that larger engine, and on the 29th day of May, 1918, one year after this engine was started to be designed, we had passed all those difficulties, had engineered and developed it, put it into a manufacturing proposition and delivered into service over 1100 of them.

Now that is an accomplishment that never has been equaled in industry anywhere. Those of you who are familiar with the automobile business know that no automobile motor of any size or strength has ever been put into service without at least a year of experimentation and development on it. This Liberty engine had no such year of development before it was put into production, and it did not need it, for the reason that the design was proper when it was made. You have heard about changes on that engine. From the date it has been made until now there have been no fundamental changes on that engine. We have changed the oiling system, but there aren't any fundamental changes.

The changes that you have heard about are of two classes: We know those were required by the two increases in horsepower that I have told you of, and the other the manufacturing changes that always are discovered in the process of production. And those are all the changes that have been made on this engine during the time that it has been in production.

Now from the 29th day of May until the armistice was declared the production of these engines jumped by leaps and bounds, until, during the month of October, the production of Liberty engines was 3878, or over 150 for every working day in that month.

Otto Praeger, Assistant Postmaster General, told of the future that lay in the mail service for planes. He said great climbing ability and such things were not so much in demand as were landing ability and other peace-time qualifications.

Early in the evening a large number of flyers from overseas marched into the hall behind a "Spirit of '76" drum corps amid the applause of the diners.

The meeting also had as a feature the presence of Major Albert D. Smith and others who at 5.30 o'clock the same afternoon completed a trans-continental flight, begun Dec. 4, for observation and mapping purposes.

The banquet was presided over by President Frank H. Russell, of the association, and at the speakers' table were:

Major General W. L. Kenly, Chief of the Division of Military Aeronautics; Charles F. Kettering, president of Society of Automotive Engineers; Major H. Dourif, French Aviation Mission; Hon. H. Snowden Marshall, former U. S. District Attorney; Captain N. E. Irwin, U.S.N., Director Naval Aviation Division; Hon. W. C. Potter, Assistant Director of Aircraft Production; Henry A. Wise Wood, vice-president Aero Club of America; Dr. S. W. Stratton, secretary of Bureau of Standards; Hon. Grosvenor B. Clarkson, Director of Council of National Defense; Benjamin S. Foss, secretary Manufacturers' Aircraft Association, Inc.; Rear Admiral William S. Smith, attached to Naval Consulting Board; Hon. John D. Ryan, Brigadier-General J. D. Cormack, R.A.F., British War Mission; Rev. Nehemiah Boynton, D.D.; Colonel J. A. Mars, Director of Aircraft Production; Hon. Otto Praeger, Second Assistant Postmaster General; Lieut. Alberto Cantoni, Italian Military Mission for Aeronautics in U. S. A.; Lieut. H. H. Emmons, U.S.N., Chief of Engine Production Department, Bureau of Aircraft Production; Col. William A. Bishop, R.A.F., D.S.O., V.C.; Harry Bowers Mingle, treasurer Manufacturers' Aircraft Association, Inc.

## Studebaker Government Orders Canceled

SOUTH BEND, Jan. 8—It is understood that all of the Government business under order to the Studebaker Corp. has been canceled. This includes the chassis order for Great Britain as well as the other various orders for the United States.

## To Complete Galveston Naval Airplane Base

GALVESTON, TEXAS, Jan. 8—It is authoritatively announced that the construction of the ten buildings that are to comprise the industrial group and three hangars of the hydroplane training station which the Government is to establish here will be started about Sept. 1. There will be no change in the original plans as a result of the signing of the armistice, it is stated. The proposed station will cost approximately \$2,000,000. Considerable work in the nature of preparing the site for the proposed buildings has already been done.

The bulkheading and filling necessary to raise the site of the plant, which has been moved 1100 ft. east of the original location, to an elevation of 6 ft. above mean low tide, is one-half completed. One dredge is at work and another will be added this week.

The plant, when completed, will be made easily accessible by shell road and rail trackage from the main lines of the Southern Pacific. The men in training will be provided with hospital facilities and means of entertainment during their rest periods. The machines used will be of two sizes, the larger, or bombing planes, having a carrying capacity of six men, in addition to their guns and bombs, and the smaller ships, as their users call them, will carry two men and their fighting apparatus. The larger machines will have a spread of wing of 127 ft.

According to present plans, between twenty-four and thirty planes of the largest type in use by the Government and 800 men will be on duty at the station by the middle of the present year.

## New Issue of General Motors Stock

NEW YORK, Jan. 8—Holders of Chevrolet common stock will be permitted to subscribe for a new issue of common stock of the General Motors Corp. at \$118 a share. A holder of one share of Chevrolet stock will have the privilege of subscribing for one-tenth of one share of General Motors at the above price. A similar privilege will be accorded stockholders of the United Motors Corp. They are to be permitted to subscribe to the extent of one-fifth of the number of shares of General Motors common which will be received by the United Motors Corp. stockholders in the distribution of its assets based on holding of record Jan. 15. The price will be the same as to Chevrolet and General Motors stockholders.

## No Empire 1919 Models

INDIANAPOLIS, IND., Jan. 8—The Empire Automobile Co. will not be in production with 1919 models, according to Charles B. Sommers, one of the financial heads of the concern. The lease on the 3-story plant in which the manufacturing activities of the company have been carried on expired in December and the company has not renewed it, as it is expected to lease or construct a building better suited to its needs.



# Manufacturers' Aircraft Association Dinner, January 7, 1919



**T**HERE were—somebody said—600 there. The diners represented many branches of aircraft manufacture and of the aviation branches of the army and navy. The flags of the Allies adorned the Waldorf-Astoria and an appropriate atmosphere was effected by numerous propellers, radiators, balloons and miniature planes. The miniature models, suspended everywhere, showed early types and late developments.

Graham W. Brogan will on Jan. 15 assume the duties of advertising manager for the Black & Decker Mfg. Co., Baltimore. He was formerly advertising manager for the Duesenberg Motor Corp.

Geo. H. Treviranus on Jan. 1 became sales manager of the Gemco Mfg. Co., Milwaukee. He succeeds L. A. Raash, who resigned to become affiliated with Walden-Worcester, Inc., Worcester, Mass.

A. H. Doolittle has been elected secretary and general manager of the Sunderman Corp., Newburgh, N. Y. He was formerly sales manager of the Zenith Carburetor Co.

F. C. H. Froesch has been made export manager of the American Rubber & Tire Co., Akron. He was formerly in the export department of the Firestone Tire & Rubber Co.

N. G. Rost, general sales manager of the Duesenberg Motors Corp., who has been in England and France for the past three months in the interests of the company, has returned and will take up his duties again at the 120 Broadway, New York, office.

Joseph P. Ripley, who has been in charge of the Fisk Rubber Co.'s Government sales at Washington for the past year, and was also Baltimore district manager, has been promoted to central district manager for the same company. The central district is one of the largest in the sales organization of the Fisk company, including twenty direct branches. Its headquarters are at Chicago, and it comprises the States of Illinois, Indiana and parts of Wisconsin, Iowa and Kentucky. Mr. Ripley succeeds Claude Platt, who has been appointed special factory representative.

#### Estep Died Doing His Duty

NEW YORK, Jan. 7.—Estep was a part of American automotive history. Estep, Harry Perry and Herbert Stephens were co-editors of *The Automobile* when that publication was started in 1902. At one time he was editor of *Motor Age*. He was later advertising manager of the Packard Motor Car Co. and later with the Cheltenham Advertising Agency. He went "over" for Leslie's.

Editor AUTOMOTIVE INDUSTRIES: The mere fact that Ralph Estep had "gone West" in the final days of the fighting in the Argonne has been known among his friends for some time, but all details have been lacking. The following letter from my son, Herbert Stephens, 303d Engineers, with the accompanying clipping, furnishes the missing information. After working about Verdun and in Serbia two years ago as a war photographer for *Leslie's*, and doing the same work on this side throughout the different cantonments, Estep was serving in the Signal Corps of the A. E. F.

To those of us who know his high ideals of journalistic duty it will seem a mere matter of course that he sacrificed

## Men of the Industry

### Changes in Personnel and Position

#### Maun Joins Republic

ALMA, MICH., Jan. 3.—W. E. Maun has been appointed chief assistant to G. R. Wilbur, director of purchases for the Republic Motor Truck Co., Alma, Mich., succeeding C. V. Marshall. Mr. Maun will have charge of production purchases.

his life to them, and our sorrow will be tempered by the realization that "Estep" has "made good."—W. P. Stephens, 145 West 32nd Street, Bayonne, N. J.

Dear Dad: I am really crowding things by writing you at this time, as this letter should be addressed to Eleanor or Mother, but it is a special one prompted by my noticing the enclosed clipping in *The Stars and Stripes*. You can imagine how surprised and shocked I was to see it. Evidently Lt. Estep was in some way or other connected with our outfit, or one working in liaison with us, as we were working in that sector at the time he was killed. He, no doubt, passed within a short distance of me on his way up to the line, as the majority of the troops went up the main road on the last drive, of which I wrote you. We did not get as far as Sedan, as we were relieved by another division which carried on the work we had started; Lt. Estep was evidently with these men.

From all events he certainly died game, working right up till the last minute; there was a lot of this done, and in many cases the real stories of these men will never be told. For this reason the layman does not realize that a soldier does not necessarily mean a man who rushes madly ahead with either a loaded rifle or a bayonet and has a hand-to-hand fight with the enemy; for example, the infantry and artillery would be entirely lost without the work of such men as Lt. Estep, and in a good many cases these men are exposed to much greater danger and hardships and stand a much smaller chance of being recognized when it comes to writing up the story of the battle, as naturally their work is not as spectacular as that of a body of men working together.—Private Herbert Stephens, Company A, 303d Engineers, American Ex. Force, Venaray, 20 miles N. E. of Dijon, Dec. 3, 1918.

From *The Stars and Stripes* of Nov. 29, 1918.—"In the dark room of a photographic laboratory near Paris this week, two sensitized gelatine plates gave up the secret of the last minutes of Lt. Ralph Estep, who was killed within sight of Sedan after he had faced death almost daily for three months so that millions of people could see through the eye of his camera what modern war is like.

Gradually taking on lights and shadows, the two plates showed the crest of a barren hill, with shells bursting and casting up great spouts of earth, and, just beyond the

Corporal Raymond Drown, son of J. W. Drown, advertising manager of the Standard Roller Bearing Co., is reported killed in France under sad circumstances. It appears that the engineering corps of which he was a member was for over 150 days under fire without losing a man. Corporal Drown was killed after the signing of the armistice while engaged in removing mines laid by the Germans to trap tanks.

Henry L. Hornberger has been made general sales manager of the Globe Rubber Tire Mfg. Co., Trenton, N. J. He will have his headquarters at the executive offices in New York. He was tendered a farewell luncheon Dec. 31, when he left the George Batten Co., with which he had been connected for some time.

Clarence A. Nelson, vice-president of the Nelson Motor Truck Co., and also vice-president of Nelson Bros. Co., both of Saginaw, Mich., recently died of acute indigestion.

Claude Platt, who has been district manager of the central district for the Fisk Rubber Co., has been promoted to special representative.

Lieutenant J. B. Howell has been mustered out of the Artillery service and will rejoin the Bound Brook Oil-less Bearing Co. in his former position.

G. W. Stephens has been appointed sales manager of the Detroit Twist Drill Co.

crest, a valley black with the shadows of the late afternoon, a valley that holds Lt. Estep's grave.

Lt. Estep had snapped the photographs a few moments before another one of those big shells burst and left him lifeless at the side of his camera and plate pack. That was about 5 p. m. of Nov. 7, three days before the last guns of the war were fired. A dozen pencilled lines in his notebook, titles for the dozen pictures he had taken just before he was killed, make complete the story that the last photographs tell. He had written titles for every plate by numbers, and Plates Nos. 1, 2, 3, 4 and 5 showed the platoon forming for the reconnaissance. Plate 6 pictured a "slight brush," the first sight of the enemy.

The dramatic climax was shown in Plates 11 and 12, his last ones, and in his notebook the record stands:

"11 Burst. Killed."

"12 men crawling."

The pictures were all taken on a cloudy day and are full of shadows, with little contrast, and No. 11 shows only the edge of the hill and the huge, funnel-shaped shell burst. The word "killed" probably referred to what he had seen happen to the men just ahead of him. Picture No. 12 shows another huge column of flying earth with a line of doughboys dimly silhouetted against the darkness of the valley. The last writing on the page—the lieutenant's last words—were simply "Nov. 7 Pack 46." Lt. Estep had re-loaded his camera just before he fell.

#### British Highways Authorities to Increase Weight of Trucks from 5 to 6 Tons

LONDON, ENGLAND, Dec. 30.—By Mail—Highway authorities representing the Government propose to increase the maximum allowable weight of motor trucks from 5 to 6 tons and to adopt other regulatory measures concerning motor trucks in general.



**Moon in Production Again**

ST. LOUIS, Jan. 6—The Moon Motor Car Co. has again started production of the types of motor cars made before the war with slight refinements worked out during the period. It is announced that 50 per cent production will be reached by Feb. 15 and the percentage will be pushed rapidly to 100 per cent. Then the special buildings erected for the manufacture of 6-in. shells for the navy will be brought into use for the motor car plant, much of the machinery provided for that work being available for use with some alterations.

**New Livingston Radiator Corporation**

NEW YORK, Jan. 7—The rights to manufacture radiators for automobiles, trucks and airplanes under the Livingston patents formerly owned by the Livingston Radiator & Mfg. Co. of this city have been purchased by the Livingston Radiator Corp. The new corporation also takes over all the mechanical equipment and processes of manufacture of its predecessor, and will place the production of this type of radiator on a quantity basis. A new management will have charge of the affairs of the new organization. The inventor, D. McRa. Livingston, again becomes associated with the manufacture of radiators under his patents, and will be vice-president and consulting engineer. E. G. Hines is president and general manager.

**Hinkley to Make Engine Line**

DETROIT, Jan. 6—The Hinkley Motors Corp. will on Feb. 15 commence the manufacture and marketing of a full line of engines for trucks and tractors. C. C. Hinkley, who heads the organization, was formerly chief engineer of the Chalmers company, which position he left nearly 2 years ago to enter the manufacturing field at the head of a company of his own. During the past year the Hinkley company became one of the country's two largest producers of engines for the Class B standardized truck.

**New Type Roller Bearings**

CHICAGO, ILL., Jan. 4—The Perfection Roller Bearing Co. has been formed here and will place on the market several new types of roller bearings, including a non-lubricated bearing and one to install on Ford rear axles. The organization is headed by C. M. Carr, and associated with him is William R. Bullion, as secretary. The company has opened headquarters at 117 North Dearborn Street, with a factory in Englewood. C. C. Bombaugh is vice-president and treasurer.

**Automotive Absorbs Consolidated**

DETROIT, Jan. 6—For the manufacture and marketing of a complete line of automotive accessories the Automotive Productions Co. has been incorporated here. The new concern, capitalized at \$600,000, contemplates the extensive manufacture of Dann radiator filler caps, Dann automatic oil caps, gasoline tank filler caps

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged*

and top holders and a starting primer unit for Fords. The company has absorbed the Consolidated Machine Co., which has been manufacturing screw machine products. The officers are: President and director of sales, J. N. Smoot; vice-president and director of engineering, E. G. Dann, formerly with the Dann Products Co., of Cleveland; secretary and treasurer, W. C. Plummer, cashier of the Federal State Bank of Detroit.

**A. B. & B. Specialty Expands**

MILWAUKEE, Jan. 6—The A. B. & B. Specialty Co., 3302 Fond du Lac Avenue, manufacturer of motor car accessories, supplies and parts, has awarded contracts for the erection of a two-story brick factory addition, 50 x 100 ft., to provide much-needed facilities to relieve congestion in the present quarters. Charles Stilper is president and treasurer.

**Ford Dividend of \$4,000,000**

DETROIT, Jan. 7—The Ford Motor Co. has declared a dividend of 200 per cent, which is equal to approximately \$4,000,000. The first instalment of \$2,000,000 was paid Jan. 1 and the second is due Feb. 1. It will be shared by seven stockholders. It is stated that other dividends will be declared in the next few months.

**Milwaukee Forge Increases Capital**

MILWAUKEE, Jan. 6—The Milwaukee Forge & Machine Co., organized several months ago by Milwaukee interests to manufacture automotive parts, specializing in tractor material, has increased its capital stock from \$150,000 to \$250,000. The company recently completed a new machine and forge works at 340 Oklahoma Avenue and the new issue is made to provide ample working capital. Officers of the company are: President, George B. Pillar; vice-president and treasurer, John Eckert; secretary, Paul J. Ramstack.

**Madison-Kipp Drops "Lubricator"**

MADISON, WIS., Jan. 6—The Madison-Kipp Co. is the new corporate style of the Madison-Kipp Lubricator Co., one of the largest exclusive makers of force-feed lubricating devices and systems in the United States. During the past year the company manufactured oilers for tanks, tractors and other war machinery, besides producing the oiling systems for nearly two-thirds of all the farm tractors manufactured in the country.

**Globe Tube Rebuilds**

MILWAUKEE, Jan. 6—Within three days after fire destroyed the receiving, shipping and storage building of the Globe Seamless Steel & Tubes Co., at Thirty-seventh Avenue and Burnham Street, on the morning of Dec. 29, contracts had been awarded for the construction and equipment of a new building. It will be 200 x 325 ft., of brick and steel, a story and a half high, and will be completed in 40 to 50 days.

**More Room for Gray-Dort**

CHATHAM, ONT., CAN., Jan. 4—The Gray-Dort Motors Co. has completed a new three-story addition to its plant. This will give an increase of 50,000 sq. ft. in floor space.

**Canadian Plant for Republic**

TORONTO, Jan. 2—It is reported that the Republic Motor Truck Co., Alma, Mich., will erect a Canadian plant in this city, where about 5000 trucks annually are to be made for the Canadian trade.

**Victor Makes Ford Mats**

SPRINGFIELD, OHIO, Jan. 7—The Victor Rubber Co. has just closed a contract with the Ford Motor Co. for rubber mats and has recently completed an enlargement of its plant. Four new men have entered the company. They are L. H. Cooke of the American Trust & Savings Co.; Ira A. Stowe, formerly of the Ellwood-Myers Co.; Frank X. Lothschuetz, formerly city auditor, and E. D. Valentine, formerly with the B. F. Goodrich Co.

**More Money for Townsend**

JANESVILLE, WIS., Jan. 6—The Townsend Mfg. Co., manufacturer of tractors, portable and stationary gas and kerosene engines, has increased its capital stock from \$125,000 to \$175,000. A large plant addition has been completed and placed in operation.

**La Crosse Model "G" Renamed**

LA CROSSE, WIS., Jan. 5—The La Crosse Tractor Co. has dropped the name Happy Farmer in connection with its Model G tractors, which are now to be known simply as La Crosse. The Model F will be called the La Crosse Happy Farmer.

**Allis-Chalmers Adds**

MILWAUKEE, Jan. 6—The Allis-Chalmers Mfg. Co. is erecting a large addition to its main works in West Allis, suburb of this city, where it will concentrate its tractor manufacturing department and greatly enlarge the output, in addition to producing two new types to supplement the standard model. Allis-Chalmers tractors now are being made in the Reliance works, located in Milwaukee, but operations in the new tractor plant at West Allis will begin early in the spring.

## Adopt Program for N.A.D.A. Meeting

Graham and Willys Slated to Talk at Annual Gathering  
Jan. 28 and 29

ST. LOUIS, Jan. 6—A tentative program for the annual meeting of the National Automobile Dealers' Association in Chicago, Jan. 28 and 29, has been adopted. In this draft of the program, few speakers are named because the men invited, and who have accepted "if possible to be there," have not yet sent final acceptance.

There is little or no politics talked here. It appears to be a general impression that President Vesper would succeed himself. All meetings will be at the La Salle Hotel. The general meetings will be in the Red Room.

The big event, aside from the work of getting the association in shape for next year, will be the frolic, at which all hands will be guests of the Chicago Automobile Trade Association. The program as drafted follows:

### TUESDAY, JAN. 28.

- 9.00 A.M. Registration of delegates.
- 10.00 A.M. Meeting called to order. President Vesper presiding. Appointment of committees. Credential, resolution, nominating. Report of standing committees.
- 11.00 A.M. President's address.
- 12.00 Noon Luncheon in the same room.

### TUESDAY AFTERNOON.

- 2.00 P.M. Meeting called to order. President Vesper presiding. Addresses by Geo. M. Graham, Pierce-Arrow Motor Co.; John Willys, Willys-Overland Co.; to be followed by short talks on the following subjects: Good Roads, Salesmanship, Cost Keeping, Business Efficiency, Advertising.

### WEDNESDAY, JAN. 29.

- 10.00 A.M. Meeting called to order. Short talks by officers on accomplishments of association, future policies and aims. Limited discussion by members. Four-minute men only.
- 12.00 M. Luncheon.
- 2.00 P.M. Meeting called to order. Report of committees. Election of officers. Adjournment.

### WEDNESDAY EVENING

Banquet and trade frolic by Chicago Automobile Trade Association at La Salle Hotel.

### Ocean Freights Reduced

WASHINGTON, D. C., Jan. 4—Ocean freight rates between Atlantic ports and ports in South America, Asia, Japan, Australia and Africa have been reduced from one-fourth to one-third, effective for January and February loadings.

The reductions have been made by J. H. Rosseter, director of operations of the Shipping Board, and are intended to stimulate the use of tonnage now available for American exporters.

South American rates are \$22.50 per ton to North Brazil from Para to Pernambuco; \$25 to Middle Brazil from Maceio to Santos; \$30 from Pelotas to Porto Alegre; \$25 to Montevideo and Buenos Aires; \$27.50 to La Plata; \$30 to Rosario, Bahia Blanca and Port Madrya, Argentina; \$45 to Japan and China; \$40 to Manila; \$45 to Singapore and Saigon; \$52.50 to Penang, Bangkok

and Port Swettenham; \$45 to Calcutta and Colombo; \$50 to Bombay, Rangoon and Madras; \$60 to South East Indies. For Brisbane, Sydney and Melbourne the rates are \$40, with the same main tariff for New Zealand ports and \$45 for Freemantle and Adelaide. The tariff to South African ports is \$35 and to West African ports \$25.

### Automotive Products Corp. Specializes in Export

NEW YORK, Jan. 6—The Automotive Products Corp., Woolworth Building, has undertaken the export of cars, trucks, tractors, parts, accessories, etc., upon a comprehensive plan which provides not only for efficient service in the actual handling of the goods, but exercises control over the standards of the automotive products so as to insure their measuring up to a high standard. In addition, the corporation's program calls for serving the foreign merchant and looking after his interests in addition to the primary function of selling him.

The president, H. W. McAteer, and the vice-president, C. B. McElhany, of the new company, hold similar offices in the American Steel Export Co.; the general manager, E. P. Chalfant, has been prominently identified with the industry for many years, and the secretary-treasurer, C. A. Musselman, is also well known to the trade.

### Emergency Stop for Chicago-New York Airplane Mail

NEW YORK, Jan. 8—Plans are being formulated to institute the often-postponed New York-Chicago airplane mail route at an early date, though no definite date has been set. The Post Office Department has established five landing fields and emergency stops. These are at Lehigh, Pa., 105 miles; Bellefonte, Pa., 115 miles; Clarion, Pa., 87 miles; Cleveland, 128 miles; Bryan, O., 157 miles; Chicago, 166 miles. A staff of 12 pilots has been engaged for the work.

### Overland Had \$80,000,000 War Contracts

TOLEDO, Jan. 7—War contracts, valued at \$80,000,000, entailing an expenditure of \$12,000,000 for new equipment and buildings, have been completed by the Willys-Overland Co. and allied plants. The contracts included Curtiss training plane engines, French 75-mm. gun carriages, machining 8-in. shells, Liberty eight and twelve-cylinder engines, Mark 111 adapters and lifting plugs for shells, Sunbeam airplane engines and military tractors for the British Government.

### Wagon Makers Standardize Treads

CHICAGO, Jan. 8—Manufacturers of farm wagons and trucks have decided definitely to adopt the 56-in. tread and 38-in. width of bed as standard for all vehicles. It is considered likely that these standards will also be adopted in Canada. Manufacturers, however, will be permitted to sell wagons of the old pattern which were made up to Dec. 31.

## Tractor Will Change Selling

Minnesota Implement Dealers Hear How and Why It Will Revolutionize Methods

MINNEAPOLIS, Jan. 8—That the tractor will revolutionize the selling of farm equipment is the opinion of F. W. Pettit, sales manager, the Wallis Tractor Co., who to-day addressed the fifteenth annual convention of the Minnesota Implement and Vehicle Association. Mechanical power supplements or displaces horse-drawn power on the farm of said Pettit. Types of implements change from horse-drawn to power-drawn and gradually but surely we realize that with the coming of a new type of power must come a new type of selling, for power farming not only will revolutionize methods of agriculture but methods of doing business as well.

The manufacturer must necessarily see that his plant and equipment are operating on a basis of constant production; therefore it is necessary for him to seek channels of distribution for a steady output and these dealers naturally will be selected who are best equipped to assimilate this production during twelve months of the year. He will select as his dealers, those that are most likely to emerge from the final competition.

Pettit does not think the advent of the tractor means necessarily the passing of the implement dealers, but he does think that in order to survive with success and profit it is necessary for the implement dealer to make a stronger bid for tractor business than he has been doing; for beyond any doubt, with the tractor will go the tractor-drawn and tractor-driving machinery, and with the two unquestionably will go the horse-drawn line as well.

Pettit sees the development of a super-dealer who is sufficiently organized financially and otherwise to conduct a vigorous sales plan that will cover farm lighting equipment and water furnace systems, in addition to trucks, tractors and power farming machinery.

Whether the ultimate dealer be an implement dealer, or an automobile dealer, or both, it is unquestionably true, says Pettit, that in every community opportunity likely will knock first at the door of the implement dealer and when the latter has the ability and versatility to change his methods and conform to the change in conditions, he may become the ultimate dealer.

Otherwise, the outside forces which are coming into the trade, and which are accustomed to an aggressive type of salesmanship, will win. The implement dealer must meet this aggressiveness with aggressiveness, for he is certain to see arise the vigorous and hustling methods of the motor car salesman.

Prof. F. W. Peck of the University of Minnesota spoke on the tractor from the viewpoint of economical management of the farm. He indorsed the three-bottom tractor as the economical unit for Minnesota, but said the tractor, generally speaking, was no cheaper to operate than were horses, its value resting upon other considerations. Peck said the greatest difficulty tractor owners experienced in power farming was an inability to get adequate service from dealers.

F. H. Retzlaff, dealer at Newulm, Minn., told the convention that the tractor business, without the right kind of service from the dealer, was not worth a damn.

They justify their indifference toward the tractor on the ground that it is necessary to give so much free service that prevalent discounts are not sufficient to pay for this service and give them a profit in addition. They object also to the requirement of a deposit in addition.



## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

## Acids:

Muriatic, lb. ....	.02	-.03
Phosphoric (85%)..	.35	-.39
Sulphuric (60), lb..	.008	

## Aluminum:

Ingot, lb. ....	.33	
Sheets (18 gage or more), lb. ....	.42	

## Antimony, lb. .... .15 -13 1/4

## Burlap:

8 oz., yd.....	.10 1/2	
10 1/2 oz., yd.....	.16 1/2	

## Copper:

Elec., lb. ....	.23	
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## Lake, lb. .... .23

## Fabric, Tire (17 1/4 oz.):

Sea Is., combed, sq. yd.	1.62	
Egypt, combed, sq. yd.	1.30	
Egypt, carded, sq. yd.	1.27	
Peelers, combed, sq. yd.	.97	
Peelers, carded, sq. yd.	.95-1.05	

## Fibre (1/2 in. sheet base), lb. .... .50

## Graphite:

Ceylon, lb. ....	.09	-.22
Madagascar, lb. ....	.10	-.15
Mexico, lb. ....	.03 1/4	

## Lead, lb. .... .05 1/4 -06

## Leather:

Hides, lb. ....	.18	-.35 1/4
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## Nickel, lb. .... .40

## Oil:

## Gasoline:

Auto, gal. ....	.24 1/2	
68 to 70 gal.....	.30 1/2	

## Lard:

Prime City, gal..	2.25-2.30	
Ex. No. 1, gal..	1.62	

## Linseed, gal. .... 1.58-1.59

## Menhaden (Brown), gal. .... 1.35-1.36

## Petroleum (crude), Kansas, bbl. .... 2.25

## Pennsylvania, bbl. 4.00

## Rubber:

Ceylon:		
First latex pale		
crepe, lb. ....	.58	

## Brown, crepe, thin,

clear, lb. ....	.50	
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## Smoked, ribbed

sheets, lb. ....	.56	
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## Para:

Up River, fine, lb.	.61	
Up River, coarse,		

lb. ....	.36	
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Island, fine, lb..	.53	
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## Shellac (orange), lb.. .70-.72

## Speiter ..... .08

## Steel:

## Angle beams and

channels, lb. ....	.03	
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## Automobile sheet

(see sp. table.)

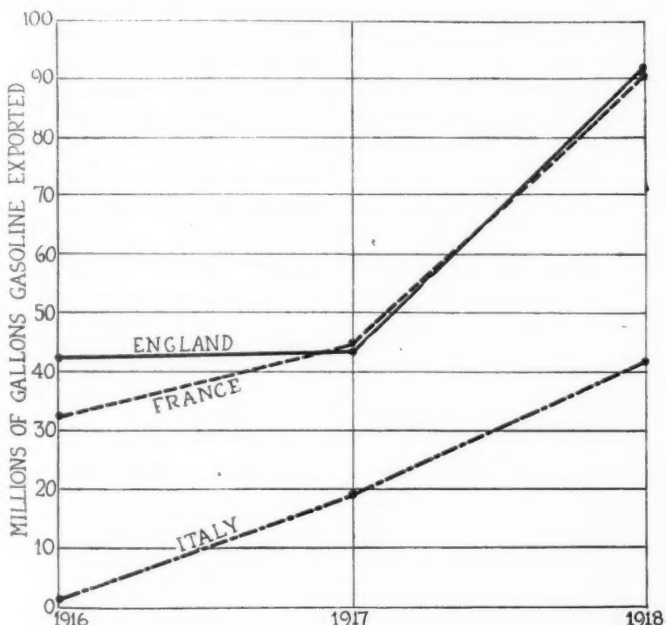
Cold rolled, lb.....	.06 1/2	
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Hot rolled, lb.....	.03 1/2	
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## Tin' ..... .71-.72

## Tungsten, lb. .... 2.00-2.50

## Waste (cotton), lb. .12 1/4-.17



England, France and Italy received 65 per cent of our petroleum product exports during ten months of 1918. The enormous demand for gasoline in the war zone is shown on this chart

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock.....	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet Extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Automotive Securities on the Chicago Exchange at Close Jan. 4

Automotive Securities				RUBBER STOCKS			
	Bid	Asked	Net Ch'ge		Bid	Asked	Net Ch'ge
Auto Body Company.....	5	8	..	Ajax Rubber Co.....	66	68	..
Briscoe Motor Car, com.....	11	..	..	Firestone T. & R., com.....	139	142	+3
Briscoe Motor Car, pfd.....	40	55	..	Firestone T. & R., pfd.....	100	101 1/2	..
*Chandler Motor Car.....	106	108	+4	Fisk Rubber Co., com.....	70	75	..
Chevrolet Motor Car.....	149	151	..	Fisk Rubber 1st, pfd.....	97	103	..
Cole Motor Car Co.....	90	105	..	Fisk Rubber 2nd, pfd.....	85	95	..
Continental Motors, com.....	8	8 1/2	..	Fisk Rubber 1st pfd, conv.....	90	97	..
Continental Motors, pfd.....	94	97	..	Goodrich, B. F., com.....	56	57	..
Edmunds & Jones, com.....	20	22	..	Goodrich, B. F., pfd.....	103 1/2	106	..
Edmunds & Jones, pfd.....	75	90	..	Goodyear T. & R., com.....	221	230	..
Electric Storage Bat.....	52	55	+3	*Goodyear T. & R., 1st pfd.....	103	105	- 1/4
Federal Motor Truck.....	32	35	..	Goodyear T. & R., 2nd pfd.....	103	105	+1
Fisher Body Co., com.....	36	38 1/2	+ 1/2	Kelly-Springfield, com.....	69	70	+ 1/2
Fisher Body Co., pfd.....	92 1/2	93 1/2	+ 1/2	Kelly-Springfield, 1st pfd.....	80	91	..
Ford Motor of Canada.....	220	230	..	Lee Tire & Rubber Co.....	21	22	-2
General Motors, com.....	131 1/2	132 1/2	+1 1/4	Marathon Tire & Rubber.....	55	55	..
General Motors, pfd.....	81 1/4	83 1/4	+2 1/4	Miller Rubber Co., com.....	142	148	..
Hupp Motor Car, com.....	4 1/2	5	..	Miller Rubber Co., pfd.....	96	95	..
*Hupp Motor Car, pfd.....	83	88	..	Rubber Products Co.....	101	101	..
Kelsey Wheel Co., com.....	29	31	+3	Portage Rubber Co., com.....	145	149	..
Kelsey Wheel Co., pfd.....	85	90	..	Swinehart T. & R. Co.....	50	60	..
Manhattan Electric S., com.....	48	..	..	U. S. Rubber Co., com.....	80	81	+3
Maxwell Motor, com.....	28 1/2	29 1/4	+ 3/4	*U. S. Rubber Co., pfd.....	109 1/2	110 1/2	+ 1/2
Maxwell Motor 1st, pfd.....	50 1/2	51 1/2	+ 1/4				
Maxwell Motor 2nd, pfd.....	18 1/2	19 1/4	- 1/4				
McCord Mfg., com.....	32	35	..				
McCord Mfg., pfd.....	93	96	..				
Mitchell Motor Co.....	23	28	-2				
Motor Products Corp.....	40	..	..				
Nash Motors Co., com.....	175	200	..				
Nash Motors Co., pfd.....	90	95	..				
National Motor Co.....	9	12 1/2	..				
Packard Motor Car, com.....	107	..	..				
Packard Motor Car, pfd.....	98 1/2	..	..				
Paige-Detroit Motor, com.....	23 1/4	24 1/4	..				
Paige-Detroit Motor, pfd.....	8 1/4	9 1/4	..				
Peerless Motor Truck.....	17	20	-1				
Pierce-Arrow Mot. Car, com.....	42 1/2	43 1/2	+ 1/2				
Pierce-Arrow Mot. Car, pfd.....	103	104	..				
Premier Motor Corp., com.....	5	..	..				
Premier Motor Corp., pfd.....	15 1/2	17 1/2	..				
Prudden Wheel Company.....	21 1/2	22 1/2	+ 1/2				
Reo Motor Car Co.....	21 1/2	22 1/2	+ 1/2				
Republic M. Truck, com.....	35 1/2	38	..				
Republic M. Truck, pfd.....	87	90	..				
Saxon Motor Car, com.....	6 1/2	8 1/2	+ 1/2				
Scripps-Booth Corp.....	21	25	..				
Stewart Warner Speed. Corp.....	82 1/4	84 1/4	4 1/4				
Stromberg Carburetor Co.....	33	38	..				
Studebaker Corp., com.....	51	52	+1				
Studebaker Corp., pfd.....	92	92 1/2	+2				
Stutz Motor Car Co.....	49 1/2	50 1/2	+1 1/2				
United Motors Corp.....	32 1/2	34 1/2	- 1/2				
White Motor Co.....	44 1/2	45 1/2	+ 1/4				
Willys-Overland, com.....	25 1/2	26 1/2	+ 1/8				
Willys-Overland, pfd.....	87	89	-1				

\*Ex Dividend.

## Calendar

ENGINEERING  
S. A. E. Meetings

- Feb. 4-6—New York. Winter Meeting. Society of Automotive Engineers, Engineering Societies' Building.
- Feb. 6—Victory Dinner, Hotel Astor, New York.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implement Designed for Tractor Belt Power and Their Characteristics."

## MOTOR SHOWS

- Jan. 11-18—Los Angeles, Cal. Automotive Exposition.
- Jan. 15-18—Spokane, Wash. Progressive Automotive Show in dealers' salesrooms. Auspices of Spokane Automobile Chamber of Commerce.
- Jan. 20-25—Shreveport, La. Shreveport Automobile Dealers' Assn. Henry B. Marks, Manager.
- Jan. 20-25—Hartford, Conn. Broad Street Armory. Auspices of Agricultural Interests.
- Jan. 24-30—Milwaukee, Wis. Eleventh Annual, Milwaukee Automobile Dealers, Inc., Auditorium. Bart J. Ruddle, Manager.
- Jan. 25-Feb. 1—Chicago. Passenger cars, Coliseum.
- Feb. 1-15—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager, Hotel Woodward, Broadway and 55th St.
- Feb. 5-6—Chicago. Trucks, Coliseum.
- Feb. 5-8—Fargo, N. D. North Dakota Automobile Dealers' Assn., Auditorium.
- Feb. 10-15—Rochester, N. Y. Rochester Automobile Trades Assn., Exposition Park. George C. Donahue, Manager.
- Feb. 10-15—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.
- Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.
- Feb. 15-22—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.
- Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilnot, Manager.
- Feb. 15-22—Albany, N. Y. Albany Automobile Dealers' Assn. State Armory.
- Feb. 17-22—Louisville, Ky. Louisville Auto Dealers' Assn.
- Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vleet, Manager.
- Feb. 17-22—Pittsfield, Mass. Pittsfield Automobile Dealers' Assn., State Armory. James J. Callahan, Manager.
- Feb. 17-22—Passenger Cars: Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.
- Feb. 17-22—Grand Rapids, Mich. Grand Rapids Automobile Business Assn. E. T. Conlon, Manager.
- Feb. 18-22—Baltimore, Md. Baltimore Automobile Dealers' Assn. and Automobile Club of Maryland, Fifth Regiment Armory. H. M. Lucius, General Manager.
- Feb. 23-March 1—Cedar Rapids, Auditorium. Automobile Dealers' Assn.
- Feb. 24-March 1—Kansas City, Mo.—Kansas City Motor Dealers' Assn. E. E. Peake, Manager.
- Feb. 24-Mar. 1—Springfield,

Mass. Automobile Dealers' Assn. Harry W. Stacy, Manager.

Feb. 27-March 6—New York Aircraft Exhibition by Aircraft Manufacturers' Association, Madison Square Garden.

March—Scranton, Pa. Thirtieth Regiment Armory, Scranton Automobile Assn.

March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrandt, Manager.

March—Great Falls, Mont.—Montana Automobile Distributors' Assn.

March—Philadelphia, Pa. Philadelphia Automobile Trade Assn. Passenger cars.

March 1-8—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Shuart, Manager.

March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.

March 3-8—Columbus, O. Columbus Automobile Show Co., Memorial Building. W. W. Freeman, Manager.

March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.

March 10-15—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gardner, Manager.

Mar. 10-15—Omaha, Neb. Fourteenth Annual. Omaha Automobile Trade Assn., Auditorium. Clarke G. Powell, Manager.

Mar. 12-19—St. Joseph, Mo. Sixth Annual, St. Joseph Automobile Dealers' Assn. Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.

March 15-22—Boston, Mass. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.

Mar. 22-29—Pittsburgh Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.

March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.

Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.

April 5-12—Montreal, Can.—National Motor Show of Eastern Canada, Victoria Rink. T. C. Kirby, Manager.

Not decided—Bridgeport, Conn. Auspices of City Battalion. E. B. Steiber, Manager.

Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.

Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.

Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.

## TRACTOR SHOWS

Jan. 20-25—Hartford, Conn. Broad Street Armory.

Feb. 24-Mar. 1—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building. Kansas City Tractor Club. Guy H. Hall, Sec.

Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show, Wichita Tractor and Thresher Club. Forum.

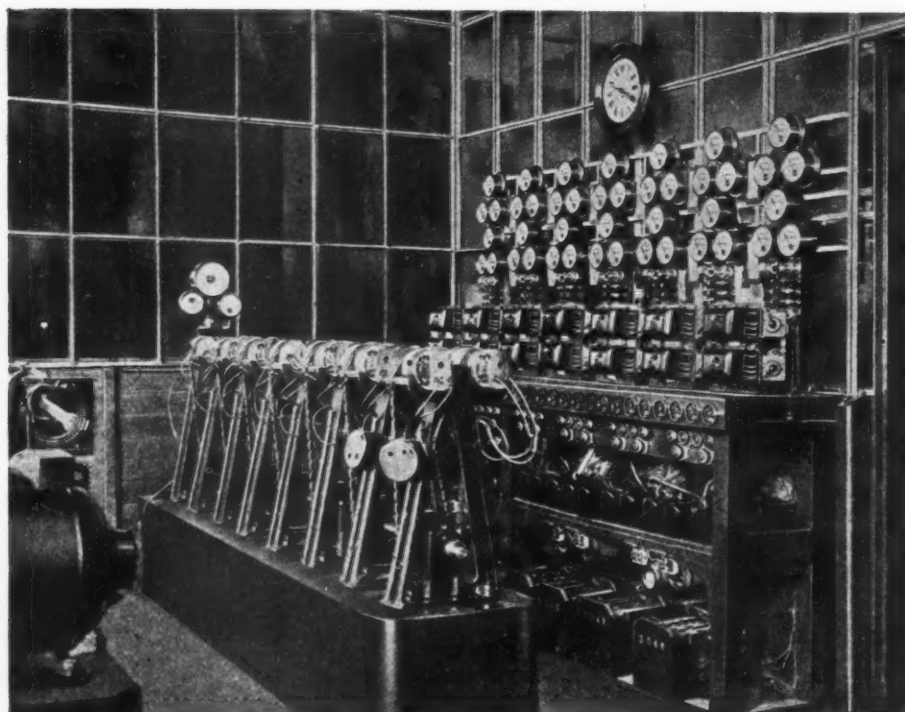
## CONVENTIONS

Feb. 4-6—New York. Meeting Society Automotive Engineers.

Jan. 7—New York. Dinner of Aircraft Manufacturers' Association, Waldorf.

Feb. 25-28—New York. Sixteenth Annual Convention. American Road Builders' Assn.

## Testing Electrical Equipment at the Fiat Plant



A special testing apparatus has been developed by the Fiat Co., Turin, Italy, for the testing of a large number of lighting sets at the same time. The stand illustrated has a capacity for testing fourteen complete systems at once